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Buxton Conference

Whilst the annual conferences of the Institute of British Foundrymen follow a traditional pattern, each one has its own special characteristics. The one held last week at Buxton, Sheffield, was noteworthy for its size—it was the largest ever held in this country except for the international gathering in 1939—the practical character of the papers, and the stress laid upon steel foundry problems. The size of the Conference introduced many implications as for instance, the use of three rooms for the staging of the annual banquet, the holding of three simultaneous sessions and the organization of a multiple transport system.

The election of Dr. Dadswell to the presidency was a wise and popular choice, as he brings to this office a wealth of experience as an administrator and a technician of no mean achievements. That an *ancien élève* of the *Ecole Supérieure de Fonderie* has been so honoured will give much satisfaction in French foundry circles. In the Presidential Address, stress was laid upon the potential benefits the jobbing foundry owner could derive from the mere recording of the data obtainable from his day-to-day production and from these figures ascertain his strength, and weaknesses, and so establish a progressive programme. It seems appropriate to remark, such work is, in France, regularly undertaken, but with the difference, regional technical and costing bureaux are available to help. The Edward Williams lectures have covered diverse subjects germane to foundry practice, but none has dealt with a more pressing theme than did Professor Sarjant. Foundry coke has deteriorated and its consumption no doubt increased. The work done by the Professor and his colleagues gives some hope that by scientific preparation and processing, the major fuel for the foundry may be considerably improved. The American exchange paper and the Sub-committee Report and film on the Running of Castings were the only two communications to be accorded the honour of a full session. Both well merited this distinction. Mr. G. A. Lillieqvist, who has gained an enviable international reputation as metallurgist, much enhanced the value of his paper by the additional information given as answers to a lively discussion. It was more difficult to assess the reception given to the various papers as we found the papers on steel foundry practice so much to our liking that we confined ourselves to the sessions covering that activity. Mr. Dewez, who presented a Paper on behalf of the *Association Technique de Fonderie de Belgique*, disclosed the techniques used for the control of quality in one of Europe's largest, best equipped and successful of steel foundries. It was interesting to hear from a lecturer with 50 years' experience on the foundry floor and in a supervisory capacity, that he believed that more worthwhile technical progress had been attained during the last ten years than in the previous forty.

Socially the Conference was of the highest order,

Buxton Conference

and in no small measure was this due to the enthusiastic co-operation of the civic authorities of Buxton, headed by the Mayor and Mayoress, their Graces the Duke and Duchess of Devonshire, and the Lord Mayor and Lady Mayoress of Sheffield, Alderman Peter Buchanan, J.P., and Mrs. Buchanan. The speeches at the banquet were of a high order, but perhaps rather too many for a mixed company. However, no-one grudged the time accorded for the presentation of a souvenir of her husband's year of office to Mrs. Colin Gresty. Though more time would have been appreciated for the Friday morning's works visits—the limits being imposed by the geographical location of Buxton—yet by skilful organization, every section was inspected. Viewed from no matter what angle this Conference was highly successful and we congratulate Mr. Makemson and his staff on the successful solution of so many organizational problems. Members were appreciative of the work done by the local committee, and high praise was given to Mr. F. Martin, O.B.E., the chairman, Brig. A. Levesley, O.B.E., T.D., the treasurer, and Mr. J. H. Pearce, the honorary secretary of the Sheffield branch.

Film Review

"Lloyd's Nowadays." The "Big Six" Film Unit has produced another excellent publicity film for F. H. Lloyd & Company, Limited, and this was shown privately in London last week. As the title indicates, it shows the present-day activities at this well-known steelworks which is claimed to be Europe's most modern and highly-mechanized steel foundry. The script was written by Edward Cook and the commentary delivered by Alvar Lidell. To some minds, no doubt, it will be regrettable that so many laudatory adjectives and superlatives have been used, so that one is inclined to receive the impression that even the canteen tea at Lloyd's is beyond reproach. Nevertheless, on the principle that nothing succeeds like success, this film should make excellent publicity for the Company, especially abroad.

An unusual feature is the interruption of the technical narrative by an account of the happy relationships existing at Lloyd's between all grades of employees from the managing director downwards, as well as the outstanding amenities which they enjoy. It is clear that Lloyd's have something to sell, that they are among the forefront of the country's foundries technically and socially, and the film emphasises these worthwhile facts.

THE MINISTRY OF LABOUR AND NATIONAL SERVICE announces that because of the need for economy in Government expenditure eight of the Ministry's eleven appointments offices are to be closed. The appointments offices at Birmingham, Bristol, Cardiff, Edinburgh, Leeds, Newcastle-on-Tyne and Nottingham will close on June 28. The Liverpool office was closed on May 30. The appointments service for the whole of the country will now be provided by the three remaining offices in London, Manchester and Glasgow. The London Appointments Office at 1-6, Tavistock Square, London, W.C.1; Aytoun Street, Manchester, 1; and at 450, Sauchiehall Street, Glasgow, C.2.

British Rollmakers Corporation

New Foundry Opened at Crewe

Some 200 staff and guests attended the inaugural luncheon of the new Crewe works of the British Rollmakers Corporation, Limited, on June 11. Mr. Owen F. Grazebrook, chairman of the Corporation, presided, the chief guests being Councillor F. Roberts, the Mayor of Crewe, and Capt. H. Leighton Davies, C.B.E., president of the Iron and Steel Institute and assistant managing director of the Steel Company of Wales, Limited. As he was also a past member of the Roll Association, CAPT. DAVIES stated that he could well hold differing views of roll manufacture and could comment in his capacity as a guest, a roll user or roll purchaser —in this respect, he commented that "a poacher often makes a good gamekeeper." He congratulated the Corporation on the modern plant and techniques adopted for roll manufacture, and wished them every prosperity. MR. GRAZEBROOK, responding, thanked the Mayor for the welcome and co-operation he had received when starting up the works. He pointed out the benefits of the site chosen for manufacture and efficient distribution of a variety of rolls. ADMIRAL SIR DENIS BOYD, Principal of Ashridge College, eloquently replied for the guests, stating that the pioneering spirit was needed in starting up such new enterprises and many risks were involved. He advocated taking such risks, as he was a profound believer in man and aristocracy—the welfare state was not a cure for poverty, there must be vision, and the opposite to poverty was wealth, which lay in industry and trade. This works typified this and he expressed his desire for its long continuance.

The group of companies constituting The British Rollmakers Corporation, Limited, includes:—R. B. Tennent, Limited, Coatbridge, Scotland; Miller & Company, Limited, Edinburgh; The British Adamite Alloy Roll Company, Limited, Crewe, and the Midland Rollmakers, Limited. The latter company is comprised of C. Akrill, Limited, West Bromwich, Thomas Perry, Limited, Bilston, and Bayliss Rolls, Limited, Crewe. The new foundry building consists of four main bays, two of 80-ft. span and two of 60-ft. span, and two intermediate bays of 40-ft. span. Melting units include four top-charged Gibbons' air furnaces, fired by Alfred Herbert coal pulverizers, two Pneulec cupolas and one oil-fired rotary furnace. There is a self-contained sand preparation plant and a patternshop and adjacent pattern stores alongside as well as a well-equipped machine-shop. It is hoped to print a detailed account of this splendid new foundry in an early issue of the JOURNAL.

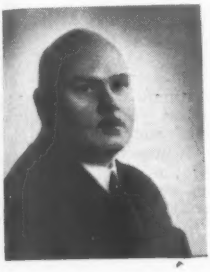
BECAUSE TRANSPORT DIFFICULTIES in Australia affected supplies of zinc concentrates from the Broken Hill mines, the level of output in 1951 of the Imperial Smelting Corporation, Limited, did not in some cases reach the high figures of 1950, states the chairman of the Company, Mr. John R. Govett. Towards the end of the year, however, the Australian transport situation improved, and the prospects for future supplies of zinc concentrates have become more satisfactory.

I.B.F. Awards 1952

Presentation of the following awards took place at the Annual General Meeting of the Institute of British Foundrymen at Buxton.

E. J. Fox Medal

MR. ARTHUR E. PEACE, who received the E. J. Fox medal of the Institute, was educated at Sir Thomas Rich's School, Gloucester, and was later a pupil in the Gloucester county analyst's laboratory, followed by periods as assistant chemist at the Westland foundry of Petters Limited, Yeovil, and Brightside Foundry & Engineering Company, Limited, Sheffield. He then became chemist and metallurgist at Ley's Malleable Castings Company, Limited, and the Ewart Chainbelt Company, Limited, Derby, subsequently being appointed director of Ley's Foundries & Engineering Company, Limited, and its two subsidiaries, Ley's Malleable Castings Company, Limited, and the Ewart Chainbelt Company, Limited.



MR. ARTHUR E. PEACE

During the war he acted as adviser to the Ministry of Supply in connection with tank tracks. He has made a number of visits to the United States and the Continent of Europe and presented several papers and lectures to branches of the Institute and to engineering societies and colleges. He is a member of the Technical Committee of the Council of Ironfoundry Associations; a member of Council, chairman of the research board, the fundamental research, and the industrial research committees of the British Cast Iron Research Association; a member of numerous committees of the British Standards Institution. In the Institute he is an elected member of general Council; a member of the technical and educational development fund committee; the literary and awards committee; and chairman of the technical council. In 1940 he was made an "Oliver Stubbs" medallist.

Meritorious Services Medal

Mr. John Jackson has been awarded the Meritorious Services Medal for 1952 in recognition of the devoted service he has rendered to the Institute in general and to many individual members in particular over a period of 30 years. Mr. Jackson, who was trained as a textile engineer, became associated with the Institute in 1922 when, in addition to his duties as production manager at Howard & Bullough, Limited, Accrington, he was appointed in sole charge of this Company's four foundries. Mr. Jackson, who has been active throughout his thirty years' membership of the Institute, was president of the Lancashire branch in 1935 and is now president-designate of the Burnley section. He has also served on the General Council of the Institute and various administrative committees as a Lancashire branch representative. He has given many papers to the branches of the Institute of British Foundrymen, the subjects ranging from cupola work to mechanization. A sphere in which Mr. Jackson has always taken a very special interest is apprentice training for both engineering and foundry work, and for many years he was the Institute's representative on the Burnley Education Committee. Amongst Mr. Jackson's technical achievements it may be recorded that after the 1914-18 war, when many foundries were experiencing great trouble with coke, he introduced a desulphurizing process which was subsequently taken up and developed by a leading chemical company. He was also responsible for a treatise on silicosis among foundry workers which attracted some notice. Immediately after the late war Mr. Jackson laid out the mechanized foundry plants now installed at the Accrington Works of Howard & Bullough, Limited. In 1946 he retired from the position which he had held for many years of general works manager of this Company.

MR. JOHN JACKSON

British Foundry Medal and Award

The British Foundry Medal and Prize of £10 has this year been awarded to Mr. K. H. Wright in recognition of the excellence of his paper on "Chilled Roll Manufacture."* Mr. Wright was educated at the Bemrose School, Derby, followed by a long attendance at Derby Technical College where he studied metallurgy, foundrywork, inorganic, organic and physical chemistry, etc. His technical studies were continued at the County Technical College, Wednesbury. He commenced his business career as assistant chemist to A. Handyside & Company, Limited, grey and malleable ironfounders, of Derby, who latterly became Derby Castings, Limited. With these concerns, which no longer exist, he rose to the position of chief chemist and metallurgist responsible for two foundries. Mr. Wright then joined C. Akrill, Limited, as chief chemist and metallurgist in 1933 and when the Company merged with T. Perry, Limited, R. B. Tennant, Limited, and Bayliss Rolls, Limited, as the British Rollmakers Corporation, Limited, he was appointed research manager for the Midland Group. Latterly, with the building of the new plant at Crewe, the Midland Companies became known as Midland Rollmakers, Limited, and he is now research manager for the organization.

MR. K. H. WRIGHT

Mr. Wright has travelled abroad fairly extensively—twice to U.S.A. on exchange of technical information and frequently to his organization's associated Companies in Germany, France and Belgium. He also served on a B.I.O.S. Mission to Germany immediately after the war to study roll foundries in that country. He has been a member of the Institute since 1937 and has served on several committees. At present he is chairman of the B.C.I.R.A. White and Chilled Iron Sub-committee and is a serving member of the Institute's technical sub-committees T.S.24 and T.S.42. He is also in his second term of office as president of

* Printed in the JOURNAL, January 11 and 18, 1951.

I.B.F. Awards 1952

the Staffordshire Iron and Steel Institute. Mr. Wright is also a member of the Iron and Steel Institute of Great Britain, his Company's representative to B.C.I.R.A., and a Fellow of the Institution of Metallurgists.

Oliver Stubbs Medal

Mr. H. G. Hall, who has been awarded the Oliver Stubbs Medal in recognition of his "services by imparting knowledge to his fellow members on the practice and theory of founding" in a series of papers extending over the period 1930 to 1949 and of his contributions to the technique of the malleable industry, was educated at King Edward's Grammar School, Birmingham, and the Rugby Lower School of Laurence Sheriff. His technical education was received at the Birmingham Central Technical College where he was awarded the first prize and silver medal in Iron and Steel Manufacture, City and Guilds, 1928. In 1925 Mr. Hall was appointed a laboratory assistant to the Midland Motor Cycle Company, Limited, following which he served for two years as chief laboratory assistant to Rubery Owen & Company. In 1928 he was appointed chief metallurgist to Shotton Bros., Limited, a post which he relinquished in 1937 to become chief metallurgist of Castings, Limited, Walsall. In 1945 the latter firm appointed him technical director, a post which he still holds. His contributions to technical literature are numerous and include several papers to Institute branches. In 1949 he presented the Exchange Paper to *L'Association Technique de Fonderie* on behalf of the Institute. Mr. Hall is a past-president of the Birmingham branch and serves on two Institute technical committees. He is also a member of the American Foundrymen's Society and was the original secretary of the Walsall Joint Recruitment and Training Committee. In addition he serves on several committees of the B.C.I.R.A. and was the instigator of the conference on malleable cast iron sponsored by the Association in March last year. Mr. Hall has definite views on the need for training in the foundry industry and is a keen advocate of the facilities afforded by the National Foundry College and the National Foundry Craft Training Centre. He is also zealous for both fundamental and practical research and constantly urges a more rapid application of the results of such work. In private life he is reported to bring to his hobby of golf an enthusiasm comparable to that which he devotes to his professional interests, but with considerably less successful results.

MR. H. G. HALL

A NEW TYPE OF TRAINING SCHEME for the mechanical engineering industry due to begin in Leeds College of Technology in September has been accepted in principle by the Engineering and Allied Employers' Leeds and District Association. The proposed scheme extends over four years, trainees spending six months in the college and six months in a works each year. The co-operation of about 30 firms is needed in order that 15 to 20 students may take advantage of the scheme annually.

Control of Cranes by Television

For a considerable time past, an overhead travelling crane entirely subject to remote radio control has been produced by the Vaughan Crane Company, Limited, Openshaw, Manchester, and it has been extensively used in highly specialized industrial processes where it is not practicable to deal at close quarters with the materials being handled. Such conditions may be present in the handling of radioactive materials, atomic weapons, poisonous substances, and special steels during certain processes of their manufacture.

Now, however, the operator, equipped with his radio control apparatus, can also have in front of him a televised picture of exactly what his load is doing. He can adjust the control of the crane by radio, making his adjustments in accordance with the televised picture before him. The system of controlling cranes by radio has been pioneered by the Vaughan Crane Company in conjunction with the Ministry of Supply and Heenan & Froude, Limited, Worcester. It goes under the name of "Vestrad."

"Vestrad" control comprises two main units—the portable transmitter and the receiving unit panel. The portable transmitter is slung from the operator, who controls the crane by means of a small push-button panel carried in front of him. Alternatively, this control may be in the form of a small fixed station, or semi-portable type, being mounted on a light two-wheel trolley. The receiving unit panel is housed on the crane itself, and comprises the necessary amplifiers, selectors, and tuned relays to deal with the tone sources which are superimposed on each carrier wave. The new system was demonstrated at the third Mechanical Handling Exhibition.

Steel Output Up in May

The annual rate of steel output in May increased to 16,245,000 tons, against the April level of 15,866,000 tons. Output in April was affected by the Easter holiday. In May, 1951, the annual rate of steel production was 15,864,000 tons, but output then was affected by the Whitsun break.

There was a small drop in the level of pig-iron output last month, the May annual rate of 10,456,000 tons comparing with 10,472,000 tons in April.

Latest steel and pig-iron output figures (in tons) compare as follow with earlier returns:—

	Pig-iron.		Steel ingots and castings.	
	Weekly average.	Annual rate.	Weekly average.	Annual rate.
1952—1st quarter	199,100	10,355,000	307,500	15,991,000
April ..	201,400	10,472,000	305,100	15,866,000
May ..	201,100	10,456,000	312,400	16,245,000
1951—1st quarter	184,400	9,587,000	315,900	16,425,000
April ..	178,500	9,280,000	322,500	16,771,000
May ..	182,400	9,482,000	305,100	15,864,000

Latest Foundry Statistics

According to the April Statistical Bulletin issued by the British Iron and Steel Federation, there was virtually no change in the employment position in the iron-foundry industry between February 9 and March 8. The total was 154,979 as compared with 150,369 a year ago. The weekly average output of liquid steel for making steel castings was during March slightly greater at 11,400 tons than in February when the production was 11,100 tons. A year ago it was only 8,800 tons.

Grain Refinement of Non-ferrous Castings*

By G. Swinyard, M.Sc.(Eng.), B.Sc., A.I.M.

The effect of grain size on non-ferrous castings is rarely discussed in foundry literature. This omission—coupled with the familiarity of knowledge that foundrymen possess on the advantages of a fine grain size in castings—may be the reason that many castings are scrapped for many defects associated with coarse grain. Knowledge which is so familiar can be set aside very easily in the consideration of other matters unless its importance is occasionally emphasized in print.

Advantages of a Fine Grain

It is well to be reminded of the advantages which may be obtained by grain refinement. The mechanical properties of an alloy are improved and castings are less susceptible to leakage under pressure. Alloys which not infrequently crack when cooling in a cast shape are not so prone to this defect when the grain size is small. Lees[1] supports this statement in his work on aluminium alloys and suggests that the effect is due to a function of dendritic formation. Primary crystals in a fine-grained casting form a coherent network at a later stage in freezing than those of a coarse-grained casting of similar composition. This allows for a reduced amount of contraction between this stage and final solidification. In addition, stresses set up by the contraction on to hard parts in the mould would be relieved by a slight movement of small crystals. In a coarse-grained casting, however, the stress would cause local deformation and a rupture would occur. Inverse segregation is substantially reduced by grain refinement. Payne[2] made a simple explanation for this effect by considering the free passage for the counterflow of low-melting-point constituents which is provided when large dendrites are formed on cooling. The small size of primary crystals restricts this counterflow in a fine-grained casting.

Disadvantages of a Fine Grain

It should be noted that in those alloys which should have a high resistance to creep, a fine grain is a disadvantage. Another disadvantage connected with a fine grain occurs with magnesium alloys which have been strongly chilled. During subsequent heat-treatment, an extremely coarse grain will be produced especially in those areas where the original grain was finest. A great reduction in mechanical properties results from this effect, which is known as " germination."

Estimation of a Grain Refinement

Consideration of the grain size of an alloy is based on the structure which is revealed by macro-etching and not upon the modifications which may occur in the microstructure. The method is essentially arbitrary and this statement is upheld by considering the grain sizes of aluminium and of magnesium alloys. The grain size which would be regarded as fine in the former (0.20 mm.) would be regarded as coarse if found in the second group of alloys where a fine grain is estimated to be approximately 0.03 mm. There are two aspects of grain refinement. One is the actual reduction in size of grain whilst the other embraces the conversion of columnar crystals to equi-axial crystals. This latter type of grain refinement depends essentially on the treatment of the melt before pouring. A reduction in grain size may often be obtained by lowering the pouring temperature of the alloy in question, although in the case of magnesium alloys the reverse is true. The use of chills is another method which is in common use in foundries for obtaining the same effect.

Theory of Concentration Gradients

The mechanism of grain refinement has been discussed by many writers, but after a detailed examination[3] only two theories appear to withstand criticism. Northcott[4] suggested that an alloy which solidifies over a range of temperature has a composition gradient in which the high-melting-point phase is in excess in a position corresponding to the lower temperature. This is known as differential solidification and depends on the fact that where an alloy solidifies over a temperature range, the alloy first solidifying is of a different composition from the liquid and diffusion is necessary in the solid to produce homogenization. When solidification begins at the mould face, the liquid in the region of the solid particle becomes either impoverished or enriched in the added element. This liquid has a lower melting point than the liquid near the centre of the casting which is of average composition. Crystals are then deposited from the liquid of average composition, because of a fall in temperature, and these crystals are separated from the original solid by a layer of molten metal. Repetition of this effect results in the formation of an equi-axial structure. The mere existence of a concentration gradient in a solidifying wall of metal would not necessarily ensure a fine grain. If no diffusion occurred during solidification, the layer of liquid between the initial solid and the row of crystallites (Fig. 1) would be comparatively wide. The effect of diffusion is to reduce the width of this layer of liquid and thus the finest possible grain will result when the concentration gradient is just sufficient to overcome the effects of diffusion.

* Paper presented at the Buxton Conference of the Institute of British Foundrymen; based upon part of the work approved for the degree of Master of Science (Engineering) of the University of London. The Author is attached to J. Stone & Company (Charlton), Limited.

Grain Refinement of Non-ferrous Castings

In Fig. 1, the kink in the temperature-gradient curve is due to latent heat.

Nuclei Theory

The other theory which has found widespread popularity assumes the presence of nuclei in the melt. These nuclei form centres for crystallization and are reputed to be present in a fine-grained alloy. Intermetallic compounds, fragments of the original solid-solution lattice and constituents due to impurity elements have all been suggested as the source of the nuclei. The theory that peritectic systems cause a large number of nuclei by fragmentation of primary particles has been disproved by Eborall.[3] It was found that not all elements forming peritectic systems with aluminium acted as grain refiners and, although the most effective grain refiners of aluminium form peritectics, the peritectic composition is often reached before grain refinement is complete and the reaction is therefore not the governing feature.

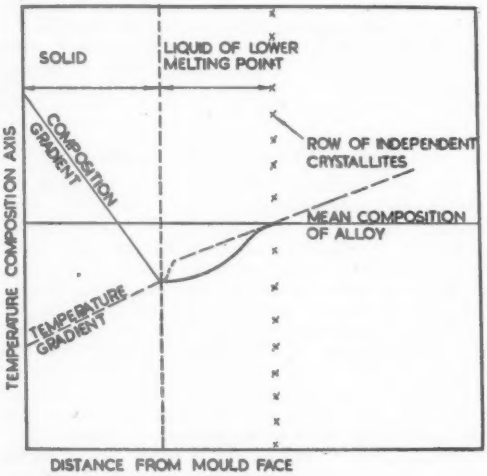


FIG. 1.—*Solidification Phenomena in the Wall of a Casting.*

Most of the work on the grain-refinement of non-ferrous alloys has been performed on the light alloys. Investigators at the British Non-Ferrous Metals Research Association have contributed a number of valuable papers[4, 5, 6] on the grain-refinement of aluminium alloys but information regarding magnesium alloys appears to come, for the greater part, from American literature.

GRAIN REFINEMENT OF ALUMINIUM ALLOYS

Titanium is perhaps the element most widely used for refining aluminium alloys and three methods have been described for its introduction into the melt. Eborall[3] found that the effectiveness of transfer of titanium to a melt was greatest (almost 100 per cent.) if a hardener alloy was used and variable if it was added as a salt. The grain refinement was complete with lower titanium content, if potassium titanofluoride was used and least effective when titanium tetrachloride was used. It is apparent that, because of its consistency, the best method to adopt in a production foundry is to use the aluminium/titanium hardener. Wells[7], unlike many investigators, appears to have tackled the problem of grain refinement from that aspect which covers the difficulties which might arise in production and it is easy to follow his reasoning in the light of practical experience. First, he suggests the use of a hardener containing five per cent. titanium in order to avoid raising the alloy to too high a temperature, thereby causing a high gas-content. Secondly, his choice of temperature—800 deg. C.—for casting his test-pieces allowed for a reproduction of conditions which might prevail in a large casting. Although it is freely accepted that the grain of an aluminium alloy coarsens rapidly as a melt is raised above 750 deg. C. it is not unusual for melts to reach a temperature of 800 deg. C Wells found that 0.15 per cent. titanium was affective in producing a fine grain even after remelting the alloy and this figure is in agreement with other writers. When excess of the refining agent was added, there was a tendency for loss in elongation. Sicha and Boehm[8] report that when the titanium addition to an aluminium/copper alloy was 0.4 per cent., the improvement in tensile properties was less because of the presence of $TiAl_3$ particles. In another alloy, a coarsening of the insoluble alpha-aluminium/iron/silicon constituent was noted, together with a tendency for its concentration at the grain boundaries.

Other elements which have been used as grain refiners for aluminium alloys include niobium, vanadium, zirconium, and boron. When niobium is added to a melt it must be thoroughly mixed by a plunging action to prevent a gravity segregation of this element. If this were allowed to happen, the bottom of the melt would be enriched in niobium, and this part of the alloy when cast, would have a finer grain than that in the upper part. This segregation occasionally takes place in heavy sections of castings. Boron is the most effective of the remaining grain-refining agents. Grain coarsening by super-heating can be much reduced by boron instead of titanium[3] but boron promotes gas absorption from the mould. The best method of adding boron to the melt is in the form of a salt—potassium borofluoride. It should be plunged into the alloy prior to casting, when decomposition will take place and boron being released will enter into the alloy.

Effect of Boron on Grain Refiners

More-recent work suggests that the addition of both titanium and boron to a melt will produce a much-refined grain and a great saving may thus be made. Less variation in results was obtained when the elements were added in the form of hardeners than when they were added to the alloy by the simultaneous reduction of molten salts of

these elements. Lower concentrations of vanadium and niobium are reported to be necessary in the presence of boron to produce marked grain refinement.

Use of Hägg's Theory

The explanation for the greater grain-refinement of a melt containing a small addition of boron over a melt with equivalent titanium content is interesting. When titanium is added to a melt, it has been postulated that nuclei for crystal formation consist essentially of $TiAl_3$[8] which was formed by peritectic reaction. This theory was found to be inaccurate by Cibula[9] who suggested that titanium carbide provided the necessary nuclei. He developed his argument by considering the grain-refining effects of the transition elements. Chromium in company with the rest of these elements forms a peritectic reaction with aluminium, but, unlike these elements, it does not cause grain refinement. Cibula theorised that this apparent abnormality could be explained by a detailed consideration of the carbides of these transition elements. Hägg found that when the ratios of the radius of the carbon atom to that of the metal atom is less than 0.59, the carbon atom can occupy interstitial positions in a simple metal lattice and highly-stable interstitial carbides are formed. It was found that a correlation could be made between these carbides and those elements which cause grain refinement of aluminium and its alloys. The ratio of the radius of the chromium carbon atom to that of the metal atom is 0.62 and consequently interstitial carbides cannot be formed.

Reason for Substitution of Boron for Carbon

Difficulty would arise in practice in trying to add carbon to a melt for the purpose of forming carbides with any of the transition elements which might be present. Eborall found that boron, when added to aluminium alloys, formed sufficient nuclei to cause a fine grain. Borides do not act as true interstitial compounds but the boron atoms form a network. The metal atoms of many diborides are more-widely spaced than in pure metals and therefore many of the transition elements form interstitial borides even though the isolated boron atom is too large to fill the interstices of the metal lattices[9]. The inter-atomic distances of aluminium boride and of the borides of the transition elements are similar to those of solid aluminium. Cibula suggested that the marked grain refinement produced by the addition of both boron and titanium to a melt is caused by the formation of a boride which is probably TiB_2 containing AlB_2 in solid solution. The lattice dimensions of the borides are similar[10, 11, 12].

GRAIN REFINEMENT OF MAGNESIUM

The grain refinement of magnesium and its alloys (once again important because of its effect on tensile properties, hot-cracking and heat-treatment) may be performed in several ways. These include (1) superheating, (2) inoculation, (3) agitation and (4) the Elfinal process.

Superheating

This is perhaps the most widely used of all methods for combating large grain-size in magnesium and its alloys with aluminium. The method is simple to follow, being merely the raising of the temperature of the melt to approximately 900 deg. C., but in practice this is not easily done. Due to the affinity of magnesium for oxygen, particularly at such a high temperature, a heavier layer of flux than normally used would be necessary to prevent burning. Such a heavy layer of flux would be more difficult to control during pouring and would increase the possibility of slag inclusions in the casting.

A necessary feature of the superheating method of grain refinement is the rapid cooling of the melt from high temperature to the pouring temperature. This would hardly be possible with large melts and, furthermore, any holding of the melt to allow the flux to separate from the metal would result in a coarsening of the grain size[13, 14]. On the economic side, the extra time, fuel-consumption and labour-costs, coupled with the increased wear on the melting pots all add to the liabilities of the process. Iron pots are used during the melting of magnesium and its alloys and, at 900 deg. C. the iron absorption by the alloy would be substantial and therefore would decrease its resistance to corrosion[14]. Finally any grain refinement obtained by superheating is lost on remelting.

It has been noted that this method of grain refinement has particular effect on alloys of magnesium and aluminium especially if manganese and/or iron are present in excess of their solubilities[14]. Possibly the most widely accepted theory of this method of grain refinement is that elements or compounds are present in the molten alloy but are not effective nucleating agents at the lower temperature of the melt. They are, however, taken into solution at the higher temperature and then re-precipitated on cooling, thus providing many effective nuclei for crystallization and consequently a fine grain.

Inoculation

If nuclei are purposely added to a melt, the process is referred to as inoculation. The inoculant which has been the most effective in producing a fine grain in magnesium alloys containing aluminium is carbon. Various methods have been tried to introduce carbon into a melt[15, 16] and, although only one of these could be regarded with practical interest, the others are worth discussing—if only to point out their disadvantages. It has been found[16] that grain refinement is possible by the use of solid carbonaceous materials, but the experimental results obtained were so erratic that this method cannot be applied to general practice. Among the materials used were graphite and granulated (high-manganese, high-iron) ferro-manganese with high carbon content. The latter was used because it is widely accepted[13, 14, 15] that the presence of iron and manganese in the class of alloys under discussion proves beneficial for good grain refinement. Although silicon carbide, when added, was not very effective, a high degree of grain refinement was obtained

when the alloy was melted in a silicon-carbide crucible. This is a method which cannot be used in practice. In the first place, the affinity of magnesium for silicon would weaken the crucible; secondly, silicon absorption by the metal would lower the mechanical properties and finally, the chloride and fluoride fluxes which are necessary to cover the melt would attack the crucible severely.

The use of a gas as a means of introducing carbon into the melt cannot be regarded as a practicable method of grain refinement. Whichever gas be used (CO_2, C_2H_2 or natural gas) it must be dried and refined. The drying of the gas is particularly necessary because of the reactions:—

(1) $Mg + H_2O = MgO + H_2$

(2) $Al_4C_3 + 6H_2O = 3CH_4 + 2Al_2O_3$

Reaction (1) relies on the affinity of magnesium for oxygen thus allowing the possibility of burning of

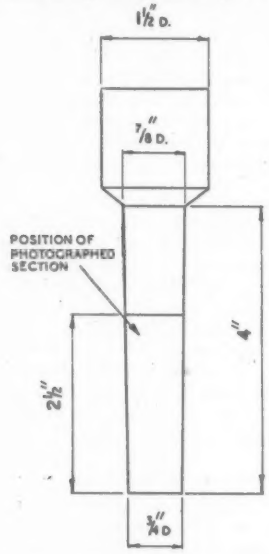


FIG. 2.—*Grain-size Test-piece for Gunmetal.*

the metal and a high hydrogen content in the casting, with attendant poor mechanical properties. One of the main theories of grain refinement supposes that minute particles of aluminium carbide provide the required nuclei. In the presence of moisture, the carbide breaks down and releases a paraffin—in this case, methane. Possibly the major drawbacks to the use of a gas for grain refinement are the difficulties of treating a small melt and the time for the operation to be completed, resulting, as in the case of superheating, in economic disadvantages in fuel consumption and labour. Attempts to de-gassify and grain refine simultaneously have been unsatisfactory[14, 16] and this failure has been attributed to the carbon being swept out of the melt by the de-gassing agent chlorine.

This idea of grain refinement as de-gassing is, however, put into practice quite regularly by the use of a volatile organic chloride called hexachlorethane (C_2Cl_6). The melt may be held at a temperature of 760 deg. C. and a tablet of hexachlorethane on being plunged into the alloy releases chlorine for de-gassing and carbon is absorbed by the melt. A casting poured from metal treated by this method has a constant and reliable fine-grain. Excess temperature is not required, the degree of grain refinement is high and consistent and finally, a comparatively short time suffices for the treatment.

Mechanism of Grain Refinement by Inoculation

It will be noticed that all alloys which have been discussed are from the magnesium/aluminium system and this allows for the following theory on the mechanism of grain refinement by inoculation. This theory suggests[16] that aluminium carbide is the active grain-refining agent and this compound will dissolve in the melt. When the alloy is poured and the casting starts to solidify, aluminium carbide is precipitated near or slightly above the liquidus line and produces a cloud of nuclei around which individual grains form. The greater the number of nuclei per unit volume of melt, the finer the grain which is produced.

Although this view has widespread acceptance, it would be interesting if information could be provided which might prove a similarity with the Hägg theory which Cibula used in his work on aluminium alloys. From the practical point of view, it may be said that inoculated melts have mechanical properties similar to, but more consistent than, superheated melts and, in addition, the grain refinement persists on remelting.

Agitation

Grain refinement has been achieved by agitating melts which have been held in the temperature range of 750 to 800 deg. C. The impossibility of agitating large melts is, however, a great drawback to the practical use of this method.

Elfinal Process

This process consists essentially of plunging one per cent. of ferric chloride beneath the surface of the melt at a temperature of 820 deg. C. The ferric chloride must be dry or else an explosion will take place. Grain refinement by this method is not affected at lower temperatures (760 deg. C.) unless manganese be present in the melt. The results obtained by this method are somewhat inconsistent.

Grain Refinement of Magnesium Alloys by Zirconium

The formation of aluminium carbide is not possible, nor indeed, desirable in many alloys of magnesium. For these alloys and for pure magnesium, grain refinement has to be performed by other means. Zirconium is used as a grain-refining agent for pure magnesium and for magnesium/zinc alloys. The refinement[17] is said to be due to the zirconium in solution in the melt precipitating during solidification to form nuclei upon which the alloy

can crystallize. The theory is built on the fact that approximately 0.5 per cent. zirconium is soluble in magnesium at the melting point of magnesium (650 deg. C.) and this solubility increases with rising temperature until at 830 deg. C. approximately 0.8 per cent. zirconium will remain in solution. Due to the solubility of zirconium in magnesium at 650 deg. C. the possibility of concentration gradients affecting the grain-size should not be overlooked particularly when, in the presence of small amounts of zirconium (0.4 per cent.), some grain refinement is possible. When 0.65 per cent. zirconium is present in unalloyed magnesium, a grain size of 0.05 to 0.1 mm. is obtained[18] but a higher degree of refinement is possible—0.03 mm.—on adding zirconium to magnesium/zinc alloys.

Zirconium is best added to the alloy in the form of a salt because it is both economical and simpler to add it in this manner. To obtain success with additions of metallic zirconium it would be necessary to add it in the temperature range 900 to 1,000 deg. C. Chloride alloying agents have not been successful because of the difficulty of avoiding chloride flux-inclusions which are generally disseminated throughout the melt. The present practice is to place a fluoride salt of zirconium in the pot in the initial charge. When the melt reaches the approximate temperature required for pouring the casting, the residue of salts remaining on the bottom of the pot are stirred into the metal. The metal is then allowed to remain in the furnace at a holding temperature whilst a check is taken by means of a chill cast fracture-bar and, during this period, any fluoride flux entangled in the melt is able to separate. This method of grain refinement is rapid, easy and effective and mechanical properties obtained from metal treated with zirconium are very consistent.

GRAIN REFINEMENT OF COPPER ALLOYS

It is disappointing to find so little information published on the grain refinement of the copper-base alloys. Iron is an effective grain-refiner of aluminium-bronze and high-tensile brass and this element is beneficial when added in quantities up to five per cent. The impression is given that metallurgical investigators are satisfied with the properties and foundry behaviour of these alloys and therefore have not sought further to improve the grain-size. In many cases, there seems to be little need for a higher degree of grain refinement but it should be remembered that any improvement in grain-size would be reflected in improved mechanical and founding properties. Care must be taken that iron, when added to a melt of these alloys, is evenly distributed. The presence of silicon in a melt of high-tensile brass causes the formation of a sludge which tends to remove iron and thus reduce the grain-refining effect. Migration of the iron constituent during the cooling of a heavy section of high-tensile brass tends to cause a variation in grain-size throughout the section.

Nickel may be added to bronzes,[19] when, it has been stated, one or two per cent. of nickel causes a finer grain-size and disperses any lead which may be present in the alloy. This is more particularly true of the high-lead alloys when a nickel addition

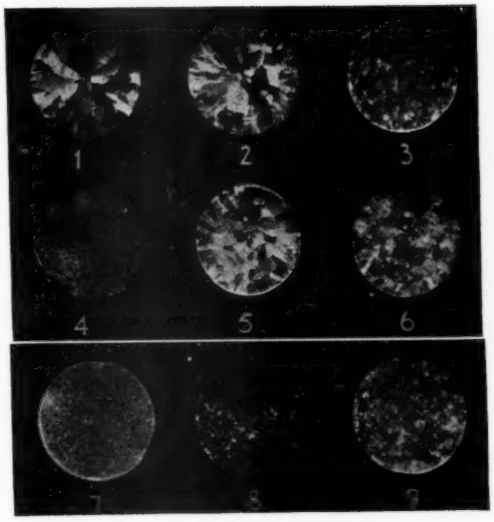


FIG. 3.—*Macrostructures of Gunmetal Test-bars cast in the Experiments listed in Table I (approximately full-size).*

results in the formation of copper/nickel dendrites on cooling. These dendrites form a network at a temperature at which the lead is still liquid and, this liquid being trapped in the interstices, becomes evenly distributed throughout the casting.

Original Work on Gunmetal

Grain refinement of gunmetals and bronzes does not appear to have been widely investigated and the following original work may throw some light on the possibilities of small amounts of phosphorus and iron as grain-refiners. This work was performed under emergency conditions when two large castings, having failed under pressure test, were macro-etched and found to have very coarse grains. Pouring temperatures were 1,140 and 1,100 deg. C. Further reduction in casting temperature was suggested in order to decrease the grain-size and a consequent increase in phosphorus content was thought to be necessary to maintain fluidity at the lower temperature. In addition, iron was postulated as having a grain-refining effect on gunmetal.

For the purpose of the experiment 150 lb. of Admiralty gunmetal was made from virgin metal and ingotted—0.02 per cent. phosphorus being added as a deoxidant. The test-piece is shown in Fig. 2. In each test about 20 lb. of the ingotted alloy was melted under an oxidizing flux and finally heated to 1,250 deg. C. The reason for the high temperature was to provide a similar temperature to that in the production foundry where the metal had to be transferred from the furnace to a large ladle before casting and therefore dropped in temperature by approximately 100 deg. C.

It will be seen from the macrostructures of the bars (Fig. 3) related to the observations recorded in

TABLE 1.—*Data from Experimental Work won Gunmetal. (Macrostructures of Bars Cast are shon in Fig. 3).*

Expt.	Pouring temp., deg. C.	Addition, per cent.	Temp. of addition, deg. C.	Type of Mould.
1	1,140	—	—	Green-sand
2	1,100	—	—	Green-sand
3	1,140	0.08 P	1,160	Green-sand
4	1,090	0.08 P	1,120	Green-sand
5	1,180	0.08 P	1,200	Green-sand
6	1,140	0.08 P	1,160	Dry-sand
7	1,140	0.08 P (0.25 Fe)	1,160	Green-sand
8	1,200	0.04 P	1,220	Green-sand
9	1,200	0.08 P (0.25 Fe)	1,230	Green-sand

Table I that a coarse grain-size was obtained when the alloy was cast without additions being made. Use of a minimum pouring temperature (1,100 deg. C.) brought no improvement but a much-refined grain was obtained after the addition of 0.08 per cent. phosphorus. This improvement was further maintained by the lowering of the pouring temperature from 1,140 to 1,090 deg. C. It is interesting to note that this finest grain was matched when iron was added to the alloy even though the pouring temperature was maintained at 1,140 deg. C. At 1,200 deg. C. there was little difference in grain size between those alloys which contained phosphorus and iron and those which contained phosphorus. Additions of iron to gunmetals and bronzes should be made with great discretion because the maximum solubility of this element in these alloys is 0.25 per cent. Iron not in solution causes rust spots on the surface in service. Phosphorus tends to reduce the elongation of these alloys if present in sufficient quantity.

It is strange that so little work has been performed on the grain refinement of bronzes. In heavy sections of castings the grain-size is often very coarse and this may be the reason that mould/metal reaction does not always provide the complete answer to failures on pressure-testing. A coarse grain could allow leakage at the grain boundaries, although the mould/metal reaction would disperse interdendritic shrinkage. Phosphorus assists both mould/metal reaction and grain refinement but, according to the experiment detailed, further grain refinement is possible by the introduction of another element.

Conclusions

In view of the amount of work which has been performed on magnesium and aluminium alloys, the lack of information of a practical nature on the grain refinement of copper-base alloys is rendered the more obvious. It must be admitted that the theories which have been found to apply to the light alloys suggest a basis for research on copper-base alloys. Although discussed in detail with aluminium alloys[3], Northcott's theory of concentration gradients[4] actually resulted from efforts to refine the grain of copper. The standard of grain-size is essentially arbitrary and a grain-size now accepted as "fine" or suitable may be improved in the light of further experimental work. Knowledge that research on the grain refinement of copper-base alloys is in progress raises the hope that these alloys may soon find applications where they are now in default through inadequate mechanical properties. Economic advantages would result from these stronger alloys, because metal could be saved by reduction in casting section and, because of the enhanced casting properties, by the reduced production of scrap. Finally, it need hardly be mentioned that foundrymen would welcome anything which reduces their difficulties in producing sound castings.

Acknowledgment

The Author wishes to acknowledge helpful criticism offered by Mr. A. R. French, A.I.M. on the re-modelling of this Paper from the original dissertation extract.

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Board Changes

BRITISH ROPES, LIMITED—Mr. Arthur P. Smith has resigned from the board.

SUPERHEATER COMPANY, LIMITED—Mr. F. Hall has been appointed a special director.

C. C. WAKEFIELD & COMPANY, LIMITED—Mr. Arnold Watson has been elected a director.

ALUMINIUM CORPORATION, LIMITED—Mr. Norman McPherson has been appointed a director.

G. HOPKINS & SONS, LIMITED—Mr. A. G. Ashton has been appointed to the board with effect from June 2.

HUNTER-PENROSE, LIMITED—Mr. G. W. Venner Dear has been appointed chairman, and Mr. H. T. Lee Miller becomes joint managing director.

German Iron and Steel Production

Pig-iron production in Germany in April was 1,000,000 metric tons, against a revised figure of 1,061,000 metric tons for March. Crude steel production was 1,212,000 metric tons, compared with 1,320,000 metric tons in the previous month.

Output of rolled steel products was 817,000 metric tons, compared with 885,000 metric tons in March. Ore production totalled 1,163,000 metric tons with an Fe content of 313,785 metric tons. In March 1,213,000 metric tons with an Fe content of 327,301 metric tons were produced.

Institute of British Foundrymen

ANNUAL GENERAL MEETING

Buxton, June 11

The annual general meeting of the Institute of British Foundrymen was held at Buxton on June 11 with Mr. Colin Gresty, the retiring president, in the Chair.

Opening the meeting, the chairman welcomed a number of foreign guests, among whom were:—Mr. John Sissener, president, Norwegian Foundrymen's Association (a member of the Institute) and Mrs. Sissener; Mr. A. Robertson, Australian Government, and Mrs. Robertson; Mr. R. J. W. Macfarlane, Australia, and Mrs. Macfarlane and children; Mr. A. Carmichael, Sydney, Australia, and Dr. Carmichael; Mr. R. Loiseau, member of the Committee of the French Association; and Madame Loiseau; Mr. Réné Sigg, Switzerland; Mr. G. A. Lillieqvist, U.S.A.; and Mr. J. J. Dewez, Belgium.

The Minutes of the annual general meeting of June 13, 1951, held at Newcastle, were taken as read on the motion of Mr. V. Delport, seconded by Mr. F. Arnold Wilson.

Report of Council

Presenting the Annual Report of the Council* for the Session 1951-52 the chairman proposed that it be accepted.

Seconding the adoption of the Report, MR. D. H. WOOD said he had had three comments to make; one was the question of membership which the president had referred to; another was in connection with Mr. Makemson's 25 years and the third was that for the first time in the history of the Institute the subscriptions had exceeded £10,000—and by no small amount. He thought the Report was entirely satisfactory.

The Report was unanimously adopted when put to the vote.

Statement of Accounts

The hon. treasurer, MR. N. P. NEWMAN, presenting the Balance Sheet for 1951 and proposing its adoption said on the assets side they had made additional investments in Post Office Savings and 2½ per cent. Funding Loan 1956/61. On the income/expenditure account, income had reached an all time record figure of over £12,500, but he had to warn them to look at the other side as well and to note that expenditure had also increased. He was not sure of the absolute record, but the point to note was that expenditure was steadily on the increase and he would not like them to be misled by that surplus of income for the year. One figure he would specially mention was the sum of £2,400 which had been expended on technical education had been refunded to them by the Joint Iron Council which covered additional work at the Institute. He formally moved the adoption of the accounts. MR. V. C. FAULKNER seconded and when put to the vote the accounts were unanimously adopted.

Technical Council Report

Proposing the adoption of the Report of the Technical Council† MR. A. E. PEACE said he hoped that although it occupied one-third of the Annual Report, it had not prevented them from studying it carefully. Their activities had been at a very high level during the year, and the new work covered a wide field and embraced items of outstanding interest and importance. The reports which were being presented to the conference would, he hoped, be received with considerable appreciation. The grant from the Joint Iron Council, as they knew, sustained their work in a manner which would not otherwise be possible and it enabled them to obtain assistance from outside laboratories. They would note in their Report that their association with other kindred institutions had been strengthened, a policy which he hoped would receive their endorsement.

The participation of the branches in the work of the Technical Council had been referred to last year by his colleague, Dr. Everest, and he would like to let the branches know of the outstanding benefit that the Technical Council derived from the excellent quality of the delegates which were elected to serve on that body. It was gratifying to note that the branches took so much interest and care in making those very important appointments.

He would specially thank the co-opted members on the Technical Council who contributed so much valuable help, and all the other members for their enthusiasm. As chairman he specially appreciated the help he received from the Chairmen's Advisory Panel, and in particular the help given by Dr. Everest, (abroad at the moment) who was an indefatigable worker and a source of great strength. He hoped members found the Technical Council was doing the sort of work they wanted and that they would continue to give it their support.

Membership

MR. A. TIPPER, seconding the adoption of the Report said he endorsed what the chairman had said particularly as to the help which they had received from the branches. It was important from the point of view of the percentage of membership represented on the various committees. As a point of interest he had checked up on the number of members who had contributed to the work during the last two years. It had amounted to 150 members, which was an indication of the widespread interest and activity in the work of the Technical

* Printed in last week's issue.

† See page 663 of this issue.

Council. Its work was one of the outstanding contributions of the Institute to the industry. It was, also, one way in which the members could personally contribute to the work of the Institute, and in addition it was an indication of the liveliness and progressiveness of the body. The reports presented to the Council were, as they knew, committee reports and did not as a rule achieve publication, but those which had been published would, he thought, stand comparison with those of any similar Institution and merited attention. He seconded the adoption and in doing so would specially mention the work of Mr. George Lambert, and the considerable assistance he had given. The Report was unanimously adopted.

Presentation of Awards

Oliver Stubbs Medal.—The president, presenting the Oliver Stubbs Medal to Mr. H. G. Hall, past-president of the Birmingham branch, pointed out that it was given for the work which Mr. Hall had done in furthering the knowledge of malleable ironfounding, for numerous important papers which he had presented and for his work for the improvement of foundry technique generally.

Acknowledging the applause which accompanied the presentation, MR. HALL said he thought it might be of interest for him to state his reasons for doing that work. Equilibrium, was perhaps the basis of all metallurgical and chemical training, and he had found that the law of balance, as such, could be applied to life in general. For example the foundry was an exciting and stimulating place in which to work, and the reward for any effort was somehow very satisfying.

As regards the Institute, the benefit which a member could derive was almost entirely dependent on the effort that he put in and as far as his own small contribution was concerned he had already been more than amply repaid for anything he had done. He had made friends of sterling value both here and abroad; widened his interest both practical and technical, and to accept that medal put him more than ever in debt to the Institute. He thanked the Council of the Birmingham branch who had proposed him for the award and felt deeply honoured in being the recipient.

E. J. Fox Medal.—MR. E. A. PEACE, chairman of the Technical Council for the past six years, winner of the E. J. Fox Medal, acknowledging the award said he understood that the terms of the award were very wide indeed and he could only assume that the assessors had cast their net very widely and on the fringe of it had managed to enmesh himself. He had now reached the age where he could not only look forward, but could also look back. Doing so he found the outstanding feature of his life had been the way in which he had been surrounded by good friends and helpmates. Particularly he had been fortunate in working for a firm which had treated him very well. His chairman and managing director, Mr. Francis Ley had always given him plenty of scope and opportunity to follow lines that he had found interesting. For almost thiry years the East Midlands branch had surrounded him with friendliness, with guidance, with encouragement and stimulation. He had belonged to the Technical Council since its inception 22 years ago and he had had the pleasure of serving under some very good chairmen. There was no doubt he owed a lot to their good example.

Meritorious Services Medal.—Mr. John Jackson, awarded the Meritorious Services Medal, was a past-president of the Lancashire branch and of the Burnley section of the Lancashire branch. Acknowledging the award MR. JACKSON said he had started life as a practical cotton spinner. What he had done since then in regard to helping on things in the foundry started through his joining the foundry to help himself to be able to look after the foundry, to coincide with the work that they were doing. Concerning the work he had done, he could not help but think of military service as a parallel case. A man got the Meritorious Services Medal for getting on with the fatigues and keeping out of trouble. So he thought he had received his medal for having voted every time in accordance with the wishes of the president!

British Foundry Medal.—Calling on Mr. Barrington Hooper to make this award, the president reminded the members that it was given for the best paper given during the year. The award was made to Mr. K. H. Wright, vice-president of the Birmingham branch for his Paper on "Chilled-roll Manufacture," and acknowledging it MR. WRIGHT said he would let them into a secret. In the Birmingham branch, finding that offers of papers were not coming forward as they should, the president had looked round the members of the Committee and had asked the question, "What about you giving one?" His reply had been that he could only talk about rolls which was a rather specialized subject and not likely to have any popular appeal, and he made various other excuses also. But he could not get out of it and had to give the Paper. Frankly he did not think the paper would have any appeal to members at all. Apparently he had been mistaken and if he had realized he would receive that award he would have taken care to express himself with greater clarity.

Diplomas and Certificates

The secretary announced that at its meeting on June 10 the Council had awarded diplomas for papers presented at branches as follow:—Mr. S. L. Finch for the Paper "Process Planning in the Steel Foundry Industry," read before Tees-side branch; Mr. J. Gorman for the Paper "Cross-section of a Non-Ferrous Jobbing Foundry," read before Scottish branch; Mr. E. J. Brown for the Paper "Castings to Resist Abrasive Wear," read before Lancashire branch; Mr. D. F. B. Tedds for the Paper "Experiences with the Investment Casting Process," read before the Birmingham branch.

Certificates to two honorary members were presented in each case by deputy as the recipients were absent. The certificate to Mr. Charles W. Bigg, hon. treasurer for many years, was handed by the president to Mr. Arthur Peace who, accepting it for presentation at a later date explained that on the

previous evening Mr. Bigg's wife had fallen and broken her leg. He knew that Mr. Bigg greatly appreciated the award.

A certificate for Mr. Daniel Sharpe, past-president of the Institute was handed to Mr. John Bell for presentation on a suitable occasion. Mr. Bell mentioned that at the moment Mr. Sharpe was in America.

Election of President

The president pointed out that it was his privilege as retiring president to propose Dr. C. J. Dadswell, senior vice-president, be elected president. He hoped they would all agree he was an eminently suitable man for the job. He would bring to it an alert mind and a progressive outlook, a lively personality and a wealth of experience of the industry, which was so important to them. It gave him great pleasure to propose Dr. Dadswell as president.

MR. F. A. MARTIN seconding the president's proposition commented that the president had already said all the nice things he would have liked to say, except one, which he was sure would not be taken amiss. They would all agree that Dr. Dadswell would make a better president than Mr. Gresty—if such a thing were possible! He was very happy to second the proposition.

When put to the meeting the proposition was carried unanimously.

Replying and thanking the members for their expression of confidence in him, DR. DADSWELL said everyone so far had been recalling their past. He had just recalled that he was a relatively new member—much newer than many present. He had been a member for just under 25 years. He felt because of that there were many who were more capable of filling that post. As in many walks of life, however, many were called, but few chosen. Those who were chosen were really symbols indicating in our democratic life that one was chosen as a representative of many To that one person, by luck, came great honour and he felt deeply honoured by their choice.

His sentiments were that a leader should also be a servant, and he hoped that during his year of office he would be able to conduct his work on behalf of the Institute so that he might be able to maintain its great traditions and that every member might be able to benefit from the activities of the coming year. The pattern set by his predecessors had been without exception of the highest order, and it would be no easy task for him to follow and maintain that standard.

Presenting the past-president's badge to Mr. Gresty, Dr. Dadswell said he felt great pleasure in doing so—it was a memento of a successful year of office and a lasting symbol of the office which he had filled with distinction. He asked Mr. Gresty to continue in the Chair for the rest of the meeting.

Senior Vice-president

MR. V. C. FAULKNER, proposing the election of Mr. E. Longden as senior vice-president, said by long custom it required no fewer than six orations to get a man safely into the presidential chair. Last year he had made speech No. 1, which had been fully recorded in the Proceedings of the Institute. On that occasion he had eulogized their junior vice-president. Now he thought he could say he was still of the same opinion, so he now made the quite formal, but very sincere, request that Mr. Longden be promoted from the position of junior vice-president to that of senior vice-president.

MR. R. YEOMAN, president of the Lancashire branch, seconded, and said he did so for many reasons. As president of the Lancashire branch he could voice the pleasure of every member that Mr. Longden had been nominated for that position and as president also, he could express their confidence in him as their counsellor and father of the branch for many years. He knew also of the excellent work Mr. Longden had done as president of the branch and the continued support he had given to his successors in office. As a craftsman employed by Mr. Longden, he could speak of his drive and initiative in the foundry. Those qualities were essential to anyone in that high office. He had much pleasure in seconding that proposition.

When put to the vote the proposition was unanimously accepted.

Acknowledging his election, MR. LONGDEN said he fully appreciated the honour they had done him. The Institute had been very fortunate in its presidents and he felt that in assuming responsibility he would have and would continue to have the guidance of the eminent men who were past-presidents, not forgetting the secretary, who coped so very effectively with the difficult tasks connected with so virile an association.

Looking back, they could see that the Institute had enabled diverse minds to come together to concentrate on the task of gathering and disseminating knowledge of the foundry and casting production; the problems besetting foundries were capable of solution, but he thought the foundryman's mental digestion had been overloaded. No doubt his robust constitution would re-assert itself eventually, and there would be a call for more information.

The Institute had been a sort of university to quite a large number of people. It had proved itself an excellent vehicle for bringing together an amazing number of scientists on the problems of metallurgy and its application in the foundry.

His experience of the Institute had been a long and varied one, during which time he had tried to overcome some foundry faults. It had always seemed to him that success in handling problems lay in reducing them to simple explanations. He thanked members for their continued confidence in him and looked forward to the opportunity of renewing many valued friendships.

Junior Vice-president

Mr. John Bell had been nominated for the post of junior vice-president, and proposing his acceptance for the post MR. N. P. NEWMAN said as they knew, Mr. Bell had for a long time served on the Council, for nearly 30 years as secretary of the Scottish branch, and he supposed the success of the

Scottish branch was largely due to the hard and continuous work which he had put in. As one gifted with more than the normal inches of man, he thought he could quite fairly speak of Mr. Bell as a modest man, but one gifted with a valiant heart who would, he knew, put the Institute before all else and make one of the finest presidents they had ever had. He proposed Mr. Bell as junior vice-president.

MR. FRANK HUDSON, who seconded the proposition, said from ten years' experience of Mr. Bell in the Scottish branch he doubted whether there was any other man whom they could elect who could put more hard work into the affairs of the Institute, who was more sincere, or who could ultimately become a finer president than Mr. Bell. He considered it a great privilege to second his nomination.

MR. BELL, replying, said he appreciated most, of the many kind things which had been said about him, the praise of the work of the Scottish branch. He hoped they would believe him when he said that branch had made him, he had not made it. He regarded his election not as an honour paid to him or a reward for anything he had done, but as an invitation and opportunity for serving the Institute in higher spheres than those which were open to ordinary members. He looked forward to the time when they might have a conference in Scotland where they would receive a hearty welcome.

Election of Auditors

The re-election of the auditors, J. & A. W. Sully & Company, Parliament Mansions, Abbey Orchard Street, London, S.W.1, for the year 1952-3, was proposed by Mr. J. H. Pearce and seconded from the body of the room. The proposition was carried unanimously.

Members of Council

The secretary at the request of the chairman announced the results of the ballot for five members of Council, and the following were elected: Dr. A. B. Everest; Mr. H. G. Hall; Mr. R. L. Handley; Mr. A. E. Peace and Mr. R. C. Shepherd.

Thanks to the Retiring President

Dr. C. J. Dadswell, proposing a vote of thanks to the retiring president, Mr. Colin Gresty, said he was sure there was no one present who had not appreciated and admired the work of Mr. Gresty during his year of office. He had maintained the traditions of the presidency in no uncertain way; he had been thoughtful in his deliberations and recommendations; he had been conscientious in carrying out all the obligations both within the Institute and in those jobs which fell to the president during his year of office, and he had been a friend to them all.

The incoming president, perhaps with the secretary and the treasurer knew and appreciated the retiring president better than anyone. He could assure them that behind the scenes Mr. Gresty had given untiring service during his year of office, which was, perhaps, not unexpected in view of the many years of service which he had given to the Institute. He proposed therefore, that a most cordial and hearty vote of thanks be given to Mr. Colin Gresty on his retirement.

Seconding the proposition, MR. NEWMAN said his experience of Mr. Gresty outside the Institute had been in connection with the Council of Ironfoundry Associations. When he wanted someone with tact, ability and determination to help him along through some particularly difficult situation, there was no man in the industry that he would rather have with him than Colin Gresty. He admired him greatly for the thorough way in which he had carried out his presidential duties for the Institute. Put to the meeting the proposition was carried with prolonged applause.

Replying, MR. GRESTY said he thought the proposer and the seconder had been far too flattering in their remarks. He had thoroughly enjoyed his year of office and he had tried in every way to do what was necessary. If he had succeeded then he was very pleased.

He would like them to know that his past-president's badge would always be treasured by him and looked upon as a memento of a very happy year. His thanks were also due to those who had helped him—the members of the Council and the members generally, and above all to Mr. T. Makemson and Mr. G. Lambert and their assistants who rendered real assistance to the president and made his job all the lighter.

The Chairman proposed that in accordance with custom a message of greeting should be sent to the American Foundrymen's Society. He knew it was very much appreciated. This was unanimously agreed.

The Secretary read out two telegrams which had been received. The first, from the American Foundrymen's Society, sent congratulations to Dr. Dadswell on his election to the presidency of the Institute and stated that foundrymen in America knew him as an outstanding scientist and British citizen and a most able administrator. The second message conveyed best wishes to the Institute at its annual conference from the Mechanical Handling Exhibition.

Other Business

MR. ROBINSON, an Australian member, said he had to convey to Dr. Dadswell the very best wishes of the Institute in Australia, and the New South Wales Division of that Institute. He was very happy to have had the opportunity of being present in England.

MR. HOWARD WOOD announced that he had received a letter from Mr. John Cameron, senior, past-president of the Institute, in which he said that at 83 he felt he could hardly attend the conference this year. He thought it would be nice if they sent him a letter of greetings from the Conference. He hoped the suggestion would meet with their approval. This was accepted with applause.

The annual general meeting then terminated, and after a short interval, members reassembled to hear the presidential address and the Edward Williams Lecture, both of which were printed in last week's issue.

Institute of British Foundrymen

ANNUAL BANQUET

Extracts from the Buxton Speeches

The Annual Banquet for the forty-ninth Conference of the Institute of British Foundrymen was held at the Palace Hotel, Buxton, on June 11, the new president, DR. C. J. DADSWELL, being in the Chair.

Proposing the toast "The Corporations of Buxton and Sheffield," MR. COLIN GRESTY, immediate past-president, said he had a difficult task in trying to do justice to two such Corporations. When he had begun to think about the subject of the toast he had soon realised how little he knew about the administration of civic affairs, except from the ratepayers' point of view, and nowadays it sometimes seemed that their point of view hardly counted at all. Therefore he could only in a general way look upon it that the duties of the civic authorities were to look after their citizens in every way they possibly could by fostering the trade and industry of their communities, and that applied whether they were the rulers of a town like Buxton, which was merely a health and pleasure resort, or whether they were rulers of a huge city like Sheffield, which was primarily of an industrial character.

In considering the activities of Buxton and Sheffield he had come to the conclusion that they were not so very different in certain respects, except that in Sheffield the material with which they dealt was steel whereas in Buxton it was very largely flesh and blood. If they thought of all the heat-treatment, quenching, tempering and annealing which was carried on in Sheffield, and then considered Buxton, they would find there also heat-treatment in the baths, in which one could be quenched, and there were also annealing rooms in which one's stresses and strains and fatigues could be relieved!

There were, however, occasional sharp divergences in the treatments. In Sheffield, for example, he felt sure it was right to say that every steel-maker's aim was to get the sulphur content of his steel as low as possible, because high sulphur was bad for the steel; in Buxton one was made to drink sulphur because it was good for one!

He hoped he had said enough to show that the Corporations of Buxton and Sheffield could be considered complementary, and that they were worthy subjects of a dual toast. In giving the toast he proposed to couple the name of the Mayor of Buxton, His Grace the Duke of Devonshire—a family name which had been so very well known for generations in Buxton—with that of Alderman Peter Buchanan, J.P., the Lord Mayor of Sheffield.

Mayoral Response

Responding to the toast on behalf of the Corporation of Buxton, HIS GRACE THE DUKE OF DEVONSHIRE, M.C., the Mayor of Buxton, said that as the two boroughs of Buxton and Sheffield were coupled together in the toast and, as Mr. Gresty had pointed out, Sheffield was a great centre of industry whereas Buxton prided itself on being a resort, he felt that in being asked to reply first that well-known maxim of "work before play" was being reversed and they were having play before work. It was for him, as Mayor of Buxton, a very proud and very pleasant occasion to see so very many members of the Institute gathered there and every member of the Corporation—and, indeed, every citizen of the town—would hope that their visit would be pleasant and that they would leave the Spa with happy recollections of it.

Buxton was blessed with waters that could heal, and the people set themselves out to please. The town was surrounded by the great mass of industrial England, something approaching a third of the population of the country actually lived within sixty miles of the boundaries of the borough, and Buxton felt that it had a duty to provide what was called, in colloquial language, a "lull" for all those who worked in industry and provided the vital materials and finished articles to enable the nation to carry on. It was necessary for everyone to relax, and Buxton was so geographically placed that they were in a position to meet the needs of all those who were doing so much to keep the country on its feet, and in that connection he hoped that all the foundrymen and, if there were such a phrase, foundrywomen, who were present would come again.

Responding to the toast on behalf of the Corporation of Sheffield, ALDERMAN PETER BUCHANAN, J.P., the Lord Mayor of Sheffield, expressed the hope that the 1952 Conference of the Institute would not only be instructive and enjoyable but would be eminently successful. It was a great pleasure to be in touch with the Institute of British Foundrymen, and he was aware that the efficiency of industry depended upon the individuals who were part and parcel of the great professional institutions. He could not imagine any other organization or professional body which bore as heavy a responsibility under existing circumstances.

Sheffield was not a beautiful city and they never claimed that it was, and it never would be, even when the planners had finished with it, but they wanted it to be known and respected and admired for what it was—an industrial and industrious city, a happy city and a great city.

"The Institute"

Proposing the toast "The Institute of British Foundrymen," MR. T. H. SUMMERSON, J.P., the Chairman of the British Steel Founders' Association, expressed his pleasure at being present, and

FIG. 1.—*Photographs taken at the Annual Banquet of the Institute of British Foundrymen at Buxton last week.* (*Details at foot of facing page.*)

FIG. 2.—*Other happy groups at the Annual Banquet of the Institute at Buxton.*

Photograph No. 2 shows (left to right) the President and his wife with the Lord Mayor and Lady Mayoress of Sheffield, the Mayor and Mayoress of Buxton, and the Master and Mistress Cutler. Among the rest of the groups many Members well-known in the foundry industry can be distinguished.

particularly on an occasion when the Institute had paid his old friend and colleague in the affairs of the steel castings branch of the industry, Dr. Dadswell, the highest honour that lay in their power, namely to install him as president. He had known Dr. Dadswell and had co-operated with him for many years, and from that experience he knew him to be a first-rate man and one who would leave on the records of the work of the Institute a name which would not be forgotten. He was happy to be able to pay that small tribute to a reliable and helpful colleague and a man of great ability.

It afforded him great pleasure to see ladies among

Photograph No. 1 (facing page) shows the President and his wife, Dr. and Mrs. C. J. Dadswell; in No. 2, Dr. Dadswell is responding to the toast of "The Institute" with the Mayor and Mayoress of Buxton (the Duke and Duchess of Devonshire) on his right, his elder daughter on his left, and with Mr. V. C. Faulkner in the foreground. Photograph No. 3 shows the three immediate past-presidents of the Institute, Mr. J. J. Sheehan, Mr. N. P. Newman, and Mr. Colin Gresty; and No. 4 the senior vice-president, Mr. E. Longden (right), junior vice-president Mr. J. Bell (left) and Mrs. Longden (centre). Photograph No. 5 shows the presentation to Dr. Dadswell by Mr. F. A. Martin; in No. 6 His Grace the Duke of Devonshire is replying to the toast of "The Corporation of Buxton"; and in No. 7, the President and his wife receive the Master and Mistress Cutler (Mr. and Mrs. J. M. Flather).

his audience, and he felt uplifted by the sight of so much grace and glamour. He had been assured that the ladies were there not in any official capacity —as the Duke had put it, as "foundrywomen"— but as the wives and daughters of members.

He wished to pay his tribute to the Institute of British Foundrymen on two counts: first, for the work which it did in translating the results of scientific research into practical application in the foundries. The Institute recognized that no amount of scientific research was going to do industry any good, or through industry the people of this country or, indeed, of the world, unless that scientific research could be carried into practical application in the plants where it could be used. Naturally, there were times when it was easier for the Institute, backed as it was by the finances of the great industry which it served, to carry out that work, because obviously more money was forthcoming in times of good trade than in times of relatively bad trade.

The real object of trade and industry was to improve the standard of living of all the people, and as they would be aware that could not be done unless what was produced by trade and industry could be translated into terms of the things which people used and into terms of the commodity or the medium of exchange whereby they acquired those goods.

Secondly, the foundry industry owed a tremendous debt to the Institute of British Foundrymen for having ended a deadly enmity between competitors and substituted for it whole-hearted co-operation. He believed it was due to the fact that in the year 1904, when the Institute was first founded, far-sighted men decided that the days when competition taken to the extent of debarring one's competitors from knowing details of one's plant and practice were over, and began to set an example of co-operation which had subsequently filled the whole of the foundry industry.

This was a highly productive age, and castings were not specified by engineers for any other reason than that they were regarded as being the best and the most economical means of fulfilling that particular application, and any foundryman who rubbed his hands with glee when he heard of a mistake which had been made by one of his competitors, was rubbing his hands with glee at something which was not in the national interest and not even in the interest of his own foundry and company. Every bad casting which found its way into the works of a customer did damage not merely to the business of the founder who made it but to the whole of the foundry industry—"When the bell tolls for one it tolls for all."

President's Reply

Responding to the toast, DR. C. J. DADSWELL, president of the Institute, said it did not often happen that one of their own members was the chief guest at their Annual Banquet: he was often an industrialist, usually a friend of the president, and sometimes a user of castings, but Mr. Summerson was a member of the Institute and all those other things as well. His group of companies made steel castings and iron castings, and used castings. Knowing his ability to be outspoken in expressing his thoughts he believed Mr. Summerson had spoken sincerely in praising their industry, and he believed he had spoken in a way which expressed the views of all proprietors of foundries and those organizations which contained sections of the foundry industry. In passing he wished to express the very sincere thanks of the Institute for the manner in which Brigadier Levesley's task as treasurer of the branch Conference Fund had been helped by the generosity of the various companies in the Sheffield and District branch.

During the past week he had been impressed by a letter which he had received from a colleague who, owing to the illness of his wife, unfortunately was unable to be present, but in writing he had made the comment: "The title of your Institute is to me most distinctive; particularly the last syllable of the last word of it. The art of founding is always a man's job, and particularly to-day, with its adjuncts of science and craft, is it necessary to be reminded that it still calls for men to guide its destinies." Working in the foundry was a man's job, and that was probably why there was such a camaraderie amongst those who were associated with the foundry. In no trade or industry was there a greater call for resourcefulness, patience and courage.

He also recalled that their American counterpart used the word somewhat similarly in calling themselves the American Foundrymen's Society. It was of interest to note that at the banquet held during the recent Congress in Atlantic City there sat down something of the order of eleven hundred people, and he was very proud that just over half that number were present at their own Annual Banquet. It was true that the growth in numbers brought with it problems in housing because they were trying to maintain the geographical characteristics of each Conference, and he hoped that their solutions, somewhat novel in certain instances, would meet with approval. In dividing the dining room into two major parts they had tried to give the effect of being one by the separation of his wife and himself, and as she would no doubt say, it was not the first time that his foundry interests had nearly led to separation! Despite those inconveniences he hoped solutions would continue to be found which would enable the Institute Conferences to have geographical significance.

As a young man he had derived the greatest benefit from works visits and technical sessions associated with the region or with the branches which had organized the various Conferences. In fact at his earlier Conferences he did not attend the banquets, either through an imagined idea that he could not spare the time or perhaps timidity at incurring the expense, but as he got older his sense of proportion had changed somewhat, and he now enjoyed banquets! However, he still thought that the works visits and the technical sessions were of the greatest importance to the junior members.

Their Institute was a national body but was also international on account of its friendships: it wel-

comed members of parallel bodies from all over the world and was welcomed by them. That was of particular interest to him because, due to his early connections and, more latterly, to the generosity of those who had employed him, he had had the good fortune to travel in various parts of the world and he had realized the value of the experience so gained. At the risk of stealing Frank Martin's thunder he personally wished to thank both Mr. Lillieqvist of the American Foundrymen's Society, who was director of research in the American Steel Foundries Organization, and Mr. Dewez of *L'Association Technique de Fonderie de Belgique*, who was works manager of Usines Emile Henricot, for attending and presenting their respective exchange papers.

The Guests

Proposing the toast "The Guests," MR. F. A. MARTIN, O.B.E., president of the Sheffield branch of the Institute, recalled an occasion when a Scottish pig-breeder proposed this toast at a farmers' dinner: "Gentlemen, my responsibility is the health of the guests, so I shall use my time to say a few words to you on the proper feeding of pigs!" However, the present audience need have no fear, as he did not intend to speak either on the feeding of castings or on any other of those subjects which employed their daily lives and bored their wives to desolation.

They were proud to have with them the chief citizens of Buxton and of Sheffield and their gracious ladies. Their chief guest, Mr. T. H. Summerson, was so well known to the steelfounders that the very idea of having to explain him to any foundryman seemed odd and slightly improper. From among the conference speakers they hailed Professor Sarjant who was, so to speak, on his own parade ground, and their overseas friends of whom the president had already spoken. To those had to be added a dazzling representation of educational and professional institutes, learned societies and research organizations, which lent brilliance to the scene. Although the Institute, being a professional body, affected to disdain such mundane matters as buying and selling they yet took honour to themselves through the presence of leaders of trade associations, whose aim was to turn the products of artifice into merchandise, and these were represented by the president of the Sheffield Chamber of Commerce. They were also pleased to see among them the managing director of Dr. Dadswell's Company, and they hoped Mr. Pickworth would find the evening enjoyable: they wanted him to remember how enjoyable it was so that he would generously spare them a great deal of their president's time during his year of office.

The Master Cutler who, with the Mistress Cutler, honoured them by his presence, was a man of mettle, true to pattern and no waster; not only his heart but his head was in the right place and of the right size, and he was sound to the core. He had been through the furnace of experience, tested, weighed in the balance and found bang on to that most rigid specification. They were fortunate that he had permitted his name to be coupled with the toast.

Master Cutler's Response

Responding to the toast, MR. GEOFFREY M. FLATHER, the Master Cutler of the Company of Cutlers in Hallamshire, said he was very conscious of the honour which the Institute had done him in inviting him to respond on behalf of their very many distinguished guests, and he ventured to suggest that it was appropriate because on the last occasion on which the Institute held its gathering in that neighbourhood it was actually in Sheffield.

He himself was not a founder, and he did not know whether that was a matter for condemnation or congratulation, but he was a user of some of their products, and for once Mr. Gresty was completely in error in saying that a high sulphur content in steel was deleterious; there were many steels which, by design, had sulphur added to them in order to achieve the qualities which they needed.

Presentation to Mrs. Gresty

Proposing the toast "The Immediate Past-president's Lady," MR. E. LONGDEN, M.I.MECH.E., senior vice-president of the Institute, said their homage to Mrs. Gresty was not a reflected recognition. The advance of a husband was very often mirrored through the eyes of a woman, and by her gentle persuasion, guidance and encouragement it was possible for a man with ability to attain almost anything. When frustration and setbacks loomed large the woman would counsel him not to let them get him down, and if he felt like clubbing the other fellow she would subdue those undesirable instincts.

In the words of Dean Inge "a gentleman is a man who is careful not to take out of life more than he puts into it," and that was the case with their friend Mr. Gresty. Nowadays people talked of rights but little of duties, and they remembered the radio parson, who had suggested that far too many had a wishbone instead of a backbone. Mr. Gresty had talents and backbone, and they were very proud to have been associated with him.

If the previous year had been Mrs. Gresty's golden time they were indeed pleased, and it was a small recognition for such gracious attention to the needs of the Institute over the past year. Although it might be comparatively transient she would remember it throughout her life. Mr. Longden then presented Mrs. Gresty with a cabinet of Crown china on behalf of the Institute.

MRS. GRESTY, responding to the toast, thanked the Institute for their great kindness and said she and her husband had enjoyed their year of office very much. Their delightful present would always remain as a memento of a happy year.

During the dancing with which the evening concluded, an interval was seized on by Mr. F. A. Martin, president of the Sheffield branch, to make a surprise presentation to the new national president, Dr. Dadswell, as the occasion was his birthday. The gift took the form of a handsome autograph album suitably inscribed and containing signatures of many prominent officers and members of the Institute. It was handed over by Mr. Martin while reading from a scroll a tribute to the president which had been prepared in blank verse.

News in Brief

MODERNIZATION of plant at the Dalzell Steel Works of Colvilles, Limited, Motherwell, has been planned and approved.

BENTON BROTHERS LIMITED, founders in all non-ferrous metals, Rodley Lane Foundry, Sheffield, have celebrated their centenary.

THE CLYDE turbine steamer King Edward, out of commission since the end of last season, has been sold by British Railways to the British Iron and Steel Corporation, who are to break her up.

ALEX. SHANKS & SON, LIMITED, Dens Iron Works, Arbroath, are to build an electricity sub-station to house additional transformers required for a new electrical annealing furnace, which is to be installed soon.

OPENING a new works' sports ground at Darlington, Brigadier J. Storar, chairman of Robert Stephenson & Hawthorns, Limited, said that his Company had more locomotive orders in hand than at any time in its history.

MR. J. E. SIMPSON has opened the Canadian office of Wild-Barfield Electric Furnaces Limited, at 72, Grenville Street, Toronto, Canada. Mr. J. E. Simpson returns to Canada after an absence of 15 years. He was born in Edmonton and came to England in 1937.

PLANS for a third extension to the Heriot-Watt College, Edinburgh, have been approved. The new extension, which will cost £300,000, will include an assembly hall with seating accommodation for 566 people, laboratories for instruction and research, and a lecture theatre.

THE GOVERNMENT has now given final approval for the erection in the Kip Valley, Greenock, of a factory for International Business Machines (U.K.), Limited, a subsidiary of an American firm who specialize in the manufacture of all types of electrical office machines and equipment.

DAVID BROWN FOUNDRIES COMPANY of Penistone, Nr. Sheffield, announce that during their annual holiday the works will be closed from July 18 until August 4, during which period no goods will be despatched. Goods inwards during the same period can only be received by special arrangement.

CARNTYNE STEEL CASTINGS COMPANY, LIMITED has come under control of the North British Locomotive Company, Limited, since the end of May. Mr. John Gibb, who was works manager with the Carntyne Steel Castings Company, has now been appointed general manager and a director of the Company.

TO-MORROW is the 25th anniversary of the establishment of Birlec, Limited, of Tyburn Road, Erdington, Birmingham 24. It has grown from very small beginnings to be the largest firm in the country solely devoted to the manufacture of electric furnaces. The Editor offers his congratulations to the firm on this achievement.

COLONEL G. W. PURSER, general sales manager of Guy Motors Limited, has returned from a business visit to India and Pakistan. The Company has appointed agents, equipped with an assembly plant, to deal with the Indian trade. Vehicles are being exported as parts, carrying a freight charge of less than 1/10th of the cost of shipping a completed vehicle.

MR. ARTHUR CROFT, chairman and managing director of Crofts (Engineers), Limited, Thornbury, Bradford, returned home last week from his six-weeks' business trip to the United States and Canada to publicize the "Croft's Process" in those countries. This is a device completed recently by Mr. Croft and two of his staff for melting cast-iron borings or metal swarf.

TWENTY-SIX BOYS from St. Austell Secondary Modern School, Cornwall, completed a year's study of "Man and Machine in Factory and Field," by a week's stay in Birmingham, ending June 13. During the week they visited a number of foundries and engineering works in the Birmingham area. Two of the youths are to take up apprenticeships with a Birmingham engineering firm next September.

A CONFERENCE was held on June 15 by the Yorkshire members of the Institute of Industrial Supervisors to discuss the part which can be played by British foremen and supervisors in increasing industrial efficiency in this country. It is an outcome of the many reports made by Anglo-American Productivity teams on the part played by American foremen in achieving and maintaining high standards of efficiency in American industry.

EMPLOYMENT for approximately 70 unskilled men and 10 women will become available in Ayr next year when the new foundry is opened by James Dickie & Company (Drop Forgings), Limited, at South Sanquhar, near Seaforth Road. Permission has been received to proceed with the work which is estimated to cost £17,625. New venture will be a semi-mechanized foundry. It will be used mainly for the light castings of agricultural machinery.

THE 150 EMPLOYEES at the works of the Blantyre Engineering Company, Limited, Blantyre, on strike since June 10 because of dissatisfaction with a production bonus, held a meeting on June 11 and decided to continue the strike. Shop stewards who addressed the meeting told the strikers that other men engaged on jobs for the firm outside Blantyre had agreed to take part in the stoppage. Their decision has brought the number on strike to nearly 200.

A BRONZE PLAQUE erected to the memory of Sir Thomas Bell, managing director of John Brown & Company, Limited, Clydebank, for 26 years, during which period the Cunard liner Queen Mary was constructed, was unveiled on June 11 by Lord Aberconway. The plaque is placed on the outside wall of the Company's offices, and among those present at the ceremony were Miss Margaret Bell, daughter of Sir Thomas, and directors and senior staff members of the Company.

THE Lancashire and Yorkshire Area meeting of members of the Association of Bronze and Brass Founders was held in Manchester on May 29. An appeal was made for full support to be given to the forthcoming Productivity Conference to be held at Harrogate. It was announced that the film, "Bronze Founding" was to be made available to educational authorities free of charge in the future. The metal reclamation plant installed by the Non-Ferrous Die Castings Company is now open to inspection by members of the Association.

COUNCILLOR B. WELCH, chairman of the West Bromwich Joint Foundry Recruitment and Training Committee, appealed for the increased support of local firms when he presided at the annual meeting of the committee. "At last there are signs that the industry is breaking down the barriers of parents' prejudice, and that school-leavers are turning to the foundry to give stable and satisfactory employment," he said. "It is up to individual firms to take over where the committee leaves off and to make sure that never again the industry suffers from the errors of the past." Councillor Welch also appealed to local firms to operate the Walsall joint apprenticeship and training scheme, which ensured systematic training with security and opportunity for progress, and Mr. V. Williams, hon. secretary of the committee added that so far, 10 West Bromwich foundries out of 45 were supporting the Walsall scheme.

Institute of British Foundrymen

TWENTIETH ANNUAL REPORT

Technical Council

The appointment of five new technical sub-committees during the twelve months ended April 30, 1952, has enlarged the activities of the Technical Council to the maximum degree commensurate with the resources at present available. During the year, sub-committees T.S.35 (Flow of Metal) and T.S.36 (Cupolas) have completed their work, and the report of sub-committee T.S.35 will be presented at the forthcoming annual conference, together with an interim report of sub-committee T.S.32 (internal stress). Six committees, the work of which was completed last year or at earlier dates, have now been dissolved.

The greatly-increased number of members of the Institute newly-participating in sub-committee work is a feature which continues to afford much satisfaction and it is desired to record the Technical Council's deep appreciation of the efforts of these and of the other more long-standing members of the sub-committees. In addition, a special tribute must be paid to the chairman of these sub-committees who, by their enthusiasm, inspire the tremendous aggregate of voluntary effort on which the whole work of the Technical Council is based.

A proportion of the grant received from the Joint Iron Council, to which full reference has been made in the annual report of the Institute, has again been allocated to the work of the Technical Council and has proved of inestimable value in enlarging the work of the sub-committees. Of the many purposes to which these funds have been applied this year, perhaps the most important has been the production by sub-committee T.S.35 of a film on the flow of metal into moulds, which will be presented at the annual conference to be held at Buxton in June.

Advisory Panel

The chairman's advisory panel comprising the chairman (Mr. A. E. Peace), Mr. L. W. Bolton, Dr. A. B. Everest and Mr. A. Tipper, has continued during the past year to give preliminary detailed study to proposed new projects to enable further investigations to be undertaken without delay when opportunity arises.

Liaison with the British Cast Iron Research Association, the Light Metal Founders' Association, the British Non-Ferrous Metals Research Association, the Light Metal Founders' Association and the Association of Bronze and Brass Founders has been strengthened during the year. These bodies are now invited to appoint representatives to serve on sub-committees carrying out investigations within their own fields of interest and at present four of the associations are so represented and the fifth is collaborating by providing specialized information in connection with the work of one committee. Representation on external technical committees, including numerous committees of the British Standards Institution connected with the foundry industry, the I.B.F./B.C.I.R.A. committee on gases in cast iron and the Joint Sands Committee, has been fully maintained during the past year. The special thanks of the Technical Council is again expressed to the many members who represent the Institute on these important external organizations.

During the past twelve months, four additional students have been appointed to serve on technical sub-committees under the J. W. Gardom Students' Fund Scheme, which continues to afford students an immensely valuable and greatly-appreciated opportunity to obtain instruction and a wider outlook on the problems of the foundry industry.

Work Completed

The following sub-committees have completed their work and in the instances noted have been dissolved during the year:—

T.S. 20—*Soundness of Iron Castings* (*chairman—Mr. A. Tipper,* M.SC., F.I.M.): The final report of this sub-committee was presented at the Annual Conference at Newcastle-upon-Tyne in June, 1951, and the sub-committee has now been dissolved.

T.S. 23—*Reclamation of Iron Castings* (*chairman—Dr. A. B. Everest*): The report of this sub-committee was presented at the Buxton Conference and later discussed at meetings of a large number of branches. Subsequently, a memorandum was prepared covering points which arose during discussions on the report and on the recommendation of the sub-committee the report, complete with the memorandum, was submitted to the British Standards Institution for consideration as a basis for a standard code of practice. The sub-committee was dissolved in September, 1951.

*T.S.*26—*Salvaging of Non-ferrous Castings* (*chairman—Mr. G. Elston*): This sub-committee's report was also presented at the Buxton Conference and was later discussed at branch meetings. Subsequently, it was submitted to the British Standards Institution for consideration as a basis for a standard code of practice. In December, 1951, the sub-committee was dissolved.

*T.S.*30.—*Synthetic Resins* (*chairman—Mr. G. L. Harbach,* A.I.M): The report of this sub-committee was presented at the Annual Conference held at Newcastle-upon-Tyne in June, 1951. As a number of requests were received from branches for presentation of the report during the current session, the sub-committee has been maintained in being *pro tempore.*

*T.S.*31.—*Heat-treatment of Grey Cast Iron* (*chair-*

I.B.F. Technical Council Report

man—Mr. T. R. Twigger, A.M.I.MECH.E., F.I.M.): The report of this sub-committee, which places on record work of great value to interested foundrymen, as well as recommendations for further work which may be followed up when opportunity arises, was also presented at the annual conference at Newcastle-upon-Tyne in June, 1951. The sub-committee was dissolved in September, 1951.

T.S.34—Moulding Boxes (chairman—Mr. J. Blakiston): As indicated in last year's annual report, the proposals of this sub-committee were considered to be in line with the recommendations of the Lemon Committee urging increased standardization in industry, with the result that the Technical Council was led to submit the sub-committee's report to the British Standards Institution for consideration as the basis for a British Standard on moulding boxes. The proposal has since been accepted by the British Standards Institution, who have formed a committee to draft a British Standard. Sub-committee T.S.34 was accordingly deemed to have completed its work and was dissolved in September, 1951.

T.S.35—Flow of Metal (chairman—Mr. E. M. Currie): Arising from the report of sub-committee T.S.29, sub-committee T.S.35 was appointed in October, 1950, with the following terms of reference:—"To study the flow of metal into moulds by means of colour cinematography or by other suitable means." Work on the film is now completed and it will be presented, with the sub-committee's report, at the Buxton and Sheffield conference to be held at Buxton in June next.

T.S.36—Cupolas (chairman—Mr. E. S. Renshaw, A.I.M.): In March, 1951, the Technical Council was persuaded, in view of the many suggestions for new work received from branch Councils which were concerned with various aspects of cupola practice, to appoint this exploratory sub-committee. The terms of reference were:—"To review problems in cupola practice, including the following:—Recarburization, desulphurization, hot-blast systems, water-cooling, mechanical charging systems, the value and effect of receivers, patching and lining practice; and to report to the Technical Council which subjects can be dealt with either by summarizing existing knowledge or by further investigation, and which subjects are unsuitable for investigation by the Technical Council. The sub-committee presented its report at the December, 1951, meeting and the Technical Council have accepted recommendations that two new sub-committees be formed, namely *T.S.43—Cupola Development* and *T.S.44—Receivers,* the terms of reference of which are recorded later in this report. The T.S.36 sub-committee was dissolved in December, 1951.

Acknowledgment

That the work of the Technical Council and its sub-committees has been sensibly enriched from two sources, namely, the financial aid derived from the J.I.C. grant and the personal efforts of the many enthusiastic members of the technical sub-committees, has already been fully acknowledged. The numerous firms who have co-operated by encouraging and granting time and facilities to members of their staffs to serve on sub-committees and who have allowed investigational work to be carried out in their foundries and laboratories constitute a third source of invaluable assistance. This record of finished work would, therefore, be gravely incomplete without an expression of the Technical Council's warmest gratitude for the inspiring example of these firms. Their help is an essential factor in maintaining this important section of the Institute's activities on its present substantial scale.

The special thanks of the Technical Council must also be recorded for the co-operation, the value of which cannot be too highly rated, that has been extended by Birmingham University, and King's College, University of Durham, on various aspects of technical sub-committee work.

Work in Progress

Work during the year of the newly-formed and the remaining active sub-committees is summarized below:—

T.S.24—Ingates (chairman—Mr. R. C. Shepherd): The sub-committee is now compiling a report of the work done so far. The report will refer mainly to fundamental factors controlling the rate of flow in runner systems and will give actual loss coefficients which have been determined experimentally for several basic runner designs. The practical application of the data has been confirmed by tests on production castings in the foundry. The data are by no means complete. To complete tests on the innumerable known variations of runner design would be, in the opinion of the sub-committee, an impossible task. It is considered, however, that much of the fundamental data given may be capable of being applied, within practical limits, to any runner system. The secondary term of reference for the sub-committee related to turbulence effects within the runner. Preliminary tests have shown that to determine these effects will require an exhaustive investigation and that the effects cannot be divorced from what takes place within the mould cavity.

T.S.32—Internal Stress (chairman—Mr. M. M. Hallett, M.SC.): This committee was formed in March, 1949, with the following terms of reference: "To investigate the problems of internal stress in castings and to co-operate with Mr. R. A. Dodd, of Birmingham University, by the provision of assistance and guidance in his work on this subject."

Although the sub-committee has completed studies of only a few types of castings of simple design and of relatively small size, and while the conclusions to be drawn from the results can only be regarded as tentative it is felt that a useful purpose would be served by wider discussion of the sub-committees' work. This work, therefore, has been fully described in an interim report which will be presented at the Buxton and Sheffield conference to be held in June next.

T.S.33—Pyrometric Method of Investigating the

Rate of Solidification of Cast Iron (*chairman—Mr. J. Hird*). Formed in September, 1949, this sub-committee has the following terms of reference:—"To explore the suitability of the pyrometric and alternative methods for investigating the rate of solidification of cast iron."

The experiments on behalf of the sub-committee at Birmingham University to obtain comparative data on the chilling properties of various typical moulding sands by means of the pyrometric method have been continued during the past year. Inconsistency in the results appeared to indicate that certain factors caused scatter to a degree which was greater than that attributable to sand differences, the principal suspected causes being composition of the metal and mould densities. Nevertheless, the sub-committee was encouraged to feel that the pyrometric method held promise as the most suitable means of investigating the influence of mould materials and a further series of experiments designed to eliminate this scatter was undertaken. If the results of these additional tests confirm the sub-committee's hopes of the method, work will proceed on the influence of mould materials on the rate of solidification. Discounting the scatter in the results from the preliminary tests a point of interest is that, as a whole, they indicate that the theoretical prediction that various types of sands would have widely varying conductivities is not reflected in the solidification times. The work now proceeding should clarify this point.

*T.S.*37.—*Cast Iron Tests and Specifications* (*chairman—Mr. J. E. O. Little*).—Certain aspects of the British Standards Institution specifications for cast iron having been challenged, the Technical Council in March, 1951, decided—not with the intention of initiating alterations to the specification, but rather to examine the position as far as concerned the points which have been challenged—to appoint this sub-committee with the following terms of reference:—

"To review the British Standards Institution's test specification for cast iron with special reference to:—

(i) The transverse test for grey iron, with particular reference to the deflection test and (ii) the relationship of test-bar to actual casting thickness."

As a first step, the sub-committee issued a questionnaire to a number of foundries to obtain information giving a representative picture concerning (*a*) the tests which they were called upon to carry out, (*b*) the specifications worked to, (*c*) the relationship of test-bar size to casting thickness, (*d*) the size of the test-bar, (*e*) grades of cast iron produced, (*f*) testing facilities, (*g*) methods of producing test-bars, etc. The information derived from this questionnaire revealed the need for some kind of standardization. Some preliminary work has since been carried out principally concerned with devising an easy method of obtaining test-bars for use in the investigations which will be made into the question of the relationship of the test-bar to the actual casting thickness. The sub-committee is also investigating the value of the transverse test and some initial experiments have been made to plot deflection against load.

In January, Mr. Charlton, owing to exceptionally heavy new business commitments, was compelled to resign his chairmanship of the sub-committee, though he is continuing to serve as a member. Mr. J. E. O. Little has been appointed in his stead.

*T.S.*38.—*Copper-base Alloy Castings* (*chairman—Mr. F. C. Evans*, F.I.M.). Acute shortages of non-ferrous materials having emphasized the need to examine the claim that the retention of private specifications by large users is leading to a waste of valuable raw materials, the Technical Council in March, 1951, formed this sub-committee with the following terms of reference:—

"To investigate the properties obtainable in copper-base alloy castings, having regard to the economical utilization of metals."

The Committee has held a number of meetings during the past year and has been encouraged to find that a number of large users have already taken some steps to rationalize the specification position. The Committee aims shortly to prepare a report which will, it is hoped, provide evidence to secure ready acceptance of a number of recommendations designed to improve the use made of the materials at present available to the industry.

*T.S.*39—*Mould Drying* (*chairman—Mr. W. J. Colton*): This sub-committee was also formed in March, 1951, with the following terms of reference:—"To review the factors involved in the drying and skin-drying of moulds, with special reference to the rate of removal of moisture from the mould surface."

During the past year, the sub-committee has made an extensive review of existing knowledge concerning the subject it is called upon to investigate, and a fairly lengthy series of experiments has been made with the object of studying the movement of moisture in moulds. The work of this sub-committee is proceeding.

T.S. 40—*Atlas of Non-ferrous Microstructures* (*chairman—Mr. A. Logan*, F.I.M.): The Technical Council decided last year to proceed with a project which has been under consideration for some time to publish an atlas of microstructures covering all cast metals. To implement this decision three new sub-committees have been appointed. The first of these (T.S.40) which was formed in June, 1951, has the following terms of reference:—"To prepare, with a view to ultimate incorporation in a complete atlas of microstructures of cast metals, typical microstructures of all cast non-ferrous alloys." The sub-committee has met on several occasions during the year and considerable progress has been made in assembling the photomicrographs which will be included in this section of the atlas.

*T.S.*41—*Atlas of Typical Steel Microstructures* (*chairman—Mr. C. H. Kain*, A.M.I.MECH.E., F.I.M.): This sub-committee, which was also formed in June, 1951, is the second of three sub-committees appointed to prepare the atlas of typical microstructures, its terms of reference being:—"To prepare, with a view to ultimate incorporation in a complete atlas of microstructures of cast metals, typical microstructures of steel castings." Substantial progress has also been made by this sub-committee in preparing and assembling the microstructures which will be included in this section of the atlas.

(*Continued on page* 670)

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered, unless otherwise stated)

June 18, 1952

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £13 1s. 6d.; Birmingham, £12 15s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £13 17s. 6d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent P, up to 3 per cent. S), d/d within 60 miles of Stafford, £15 5s. 9d.

Scotch Iron.—No. 3 foundry, £14 4s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £17 4s. 6d.; South Zone, £17 7s.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £17 14s. 6d.; South Zone, £17 17s.

Cold Blast.—South Staffs, £18 7s.

Hematite.—Si up to 2½ per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. Coast and N.-W. Coast of England, £13 11s. 6d.; Scotland (Scotch iron), £13 18s.; Sheffield, £14 9s. 6d.; Birmingham, £14 17s. 6d.; Wales (Welsh iron), £13 18s.

Basic Pig-iron.—£12 10s. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered.)

Ferro-silicon (6-ton lots).—40/55 per cent., £57 10s., basis 45% Si, scale 21s. 6d. per unit; 70/84 per cent., £86, basis 75% Si, scale 23s. per unit.

Ferro-vanadium.—50/60 per cent., 20s. 6d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 10s. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £204; ditto, copper-free, £212.

Ferro-tungsten.—80/85 per cent., 31s. 8d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 34s. 8d. per lb. of W.

Ferro-chrome (6-ton lots).—4/6 per cent. C, £85 4s., basis 60% Cr, scale 28s. 3d. per unit; 6/8 per cent. C, £80 17s., basis 60% Cr, scale 26s. 9d. per unit; max. 2 per cent. C, 2s. per lb. Cr; max. 1 per cent. C, 2s. 2½d. per lb. Cr; max. 0.15 per cent. C, 2s. 3½d. per lb. Cr; max. 0.10 per cent. C, 2s. 3¾d. per lb. Cr.: max. 0.06 per cent. C, 2s. 4d. per lb. Cr.

Cobalt.—98/99 per cent., 20s. per lb.

Metallic Chromium.—98/99 per cent., 6s. 5d. to 6s. 9d. per lb.

Ferro-manganese (blast-furnace). — 78 per cent., £43 15s. 2d.

Metallic Manganese.—96/98 per cent., carbon-free, £275 per ton.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £25 4s. 6d.; tested, 0.08 to 0.25 per cent. C (100-ton lots), £25 14s. 6d.; hard (0.42 to 0.60 per cent. C), £27 12s.; silico-manganese, £33 8s.; free-cutting, £28 8s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £31 9s.; case-hardening, £31 17s.; silico-manganese, £34 9s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £29 8s.; basic, hard, over 0.41 up to 0.60 per cent. C, £30 8s.; acid, up to 0.25 per cent. C, £31 17s.

Sheet and Tinplate Bars.—£25 3s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £29 14s.; boiler plates (N.-E. Coast), £31 1s. 6d.; chequer plates (N.-E. Coast), £31 3s.; heavy joists, sections, and bars (angle basis), N.-E. Coast, £27 17s.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £31 15s. 6d.; flats, 5 in. wide and under, £31 15s. 6d.; hoop and strip, £32 10s. 6d.; black sheets, 17/20 g., £40 12s. 6d.; galvanized corrugated sheets, 17/20 g., £57 5s. 6d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £50 18s. 3d.; nickel-chrome, £71 6s. 9d.; nickel-chrome-molybdenum, £78 14s.

Tinplates.—57s. 1½d. per basis box.

NON-FERROUS METALS

Copper.—Electrolytic, £281; high-grade fire-refined, £280 10s.; fire-refined of not less than 99.7 per cent., £280; ditto, 99.2 per cent., £279 10s.; black hot-rolled wire rods, £290 12s. 6d.

Tin.—Cash, £969 to £970; three months, £965 to £966; settlement, £969 10s.

Zinc.—G.O.B. (foreign) (duty paid), £138; ditto (domestic), £138; "Prime Western," £138; electrolytic, £142; not less than 99.99 per cent., £144.

Lead.—Good soft pig-lead (foreign) (duty paid), £129; ditto (Empire and domestic), £129; "English," £130 10s.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £159; rolled zinc (boiler plates), all English destinations, £157; zinc oxide (Red Seal), d/d buyers' premises, £166.

Other Metals.—Aluminium, ingots, £154; magnesium, ingots, 2s. 10½d. per lb.; antimony, English, 99 per cent., £270; quicksilver, ex warehouse, £72 10s. to £73; nickel, £454.

Brass.—Solid-drawn tubes, 27⅜d. per lb.; rods, drawn, 34½d.; sheets to 10 w.g., 31½d.; wire, 33½d.; rolled metal, 30⅝d.

Copper Tubes, etc.—Solid-drawn tubes, 32d. per lb.; wire, 308s. 6d. per cwt. basis; 20 s.w.g., 337s. per cwt.

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £225 to £270; BS. 1400—LG3—1 (86/7/5/2), £248 to £280; BS. 1400—G1—1 (88/10/2), £330 to £400; Admiralty GM (88/10/2), virgin quality, £335 to £350 per ton, delivered.

Phosphor-bronze Ingots.—P.Bl, £335 to £425; L.P.Bl, £285 to £335 per ton.

Phosphor Bronze.—Strip, 38¾d. per lb.; sheets to 10 w.g., 41d.; wire, 44½d.; rods, 39½d.; tubes, 37½d.; chill cast bars: solids 4s., cored 4s. 1d. (C. CLIFFORD & SON, LIMITED.)

Nickel Silver, etc.—Ingots for raising, 2s. 6¾d. per lb. (7%) to 3s. 7d. (30%); rolled metal, 3 in. to 9 in. wide × .056, 3s. 0¾d. (7%) to 4s. 1d. (30%); to 12 in. wide × .056, 3s. 1d. to 4s. 1½d.; to 25 in. wide × .056, 3s. 3d. to 4s. 3½d. Spoon and fork metal, unsheared, 2s. 9¾d. to 3s. 10d. Wire, 10g., in coils, 3s. 6¾d. (10%) to 4s. 7d. (30%). Special quality turning rod, 10%, 3s. 5¾d.; 15%, 3s. 10¾d.; 18%, 4s. 3¾d. All prices are net.

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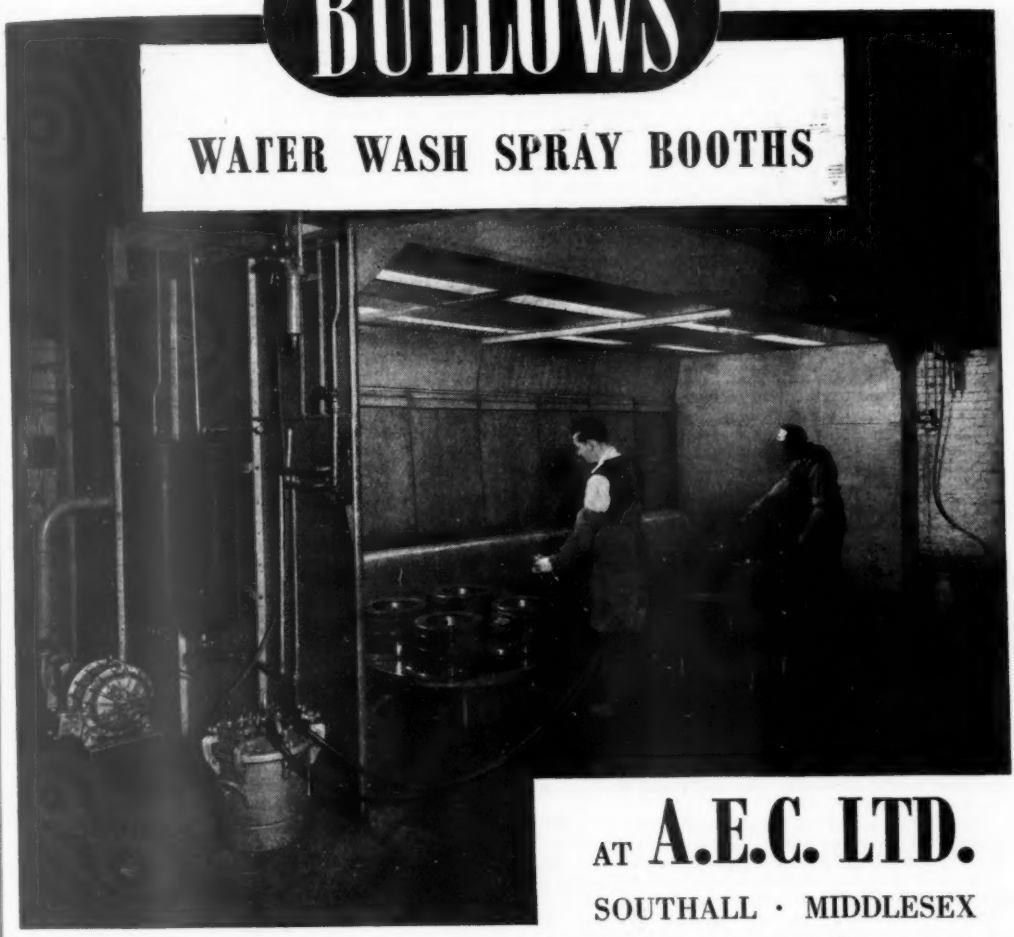

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Birthday Honours

(*Continued from page* 633)

C.B.E.

MARTIN ALEXANDER LINDSAY, M.P., a director of Gaskell & Chambers, Limited, engineers, etc., of Birmingham; JOHN PRINGLE MACKIE, a managing director of James Mackie & Sons, Limited, textile machinists, of Belfast; FRANK THOMAS MAY, assistant secretary, Ministry of Materials; ARTHUR CLAUDE MORRELL, deputy chairman, Liverpool Savings Committee, and a member of Mersey Docks and Harbour Board; LESLIE CHARLES BINGHAM PENWILL, director and secretary, Electrical Contractors' Association; HERBERT SAMMONS, managing director, D. Napier & Son, Limited, aero engine manufacturers and founders, of London; WILLIAM SAVAGE, works director and chief engineer, Ruston-Bucyrus, Limited, manufacturers of excavating machinery, of Lincoln; DONALD THOMAS ALFRED TOWNEND, director-general, British Coal Utilisation Research Association.

O.B.E.

RICHARD BELFORD, principal, Ministry of Materials; MICHAEL BRODERICK, lately regional director, Midland Region, Ministry of Fuel and Power; JACK BROOKS, principal scientific officer, Low Temperature Research Station, D.S.I.R.; BERNARD CHARLES CURLING, lately secretary, Institute of Marine Engineers; PHILIP JAMES ELLIS, managing director, R. B. Pullin & Company, Limited, gyroscopic engineers, etc., of Brentford (Middx.); KENNETH RICHARD EVANS, manager, education department, Metropolitan-Vickers Company, Limited; WYNDHAM SWEYN GOODDEN, for services to the Council of Industrial Design in Scotland; ERIC TOWERS GRAINGER, engineer, Grade 1, Engineering Division, Ministry of Supply; ERIC GRUNDY, manager, Ferranti, Limited, Moston, Manchester; REGINALD EDWARD CECIL HAWKINS, deputy director of contracts, Ministry of Works; ROBERT HIGGINS, assistant professor of metallurgy, University College, Swansea; WILLIAM ALFRED JACKSON, a director of the Telephone Manufacturing Company, Limited; STEFAN KENNETH JANSON, engineer, Grade 1, Armament Design Establishment, Ministry of Supply; EDWARD BERNARD JONES, secretary, Cammell Laird & Company, Limited, Birkenhead.

JAMES ROBERT MCKERROW, chief contracts officer, Ministry of Fuel and Power; GEORGE NOBLE, manager of Fawley Refinery, Esso Petroleum Company, Limited.

FRANK LAWRENCE SHEPHERD, operations superintendent of the iron and steel works of Dorman, Long & Company, Limited, and a special director. He has been president since 1938 of the Blastfurnace and Coke Oven Section of the North-East Iron and Steel Employers' Association and has held a similar position in the north-east section of the Iron and Steel Trades Employers' Association for the past 12 years. Mr. Shepherd is also a past-president of the Cleveland Institute of Engineers.

ROSS LEWIS STUBBS, secretary, British Non-Ferrous Smelters' Association; THOMAS ROBERTSON WEST, lately managing director, C. & H. Crichton (1921), Limited, shiprepairers, coppersmiths, etc., of Bootle, Liverpool.

M.B.E.

MISS GWENDOLINE GLADYS AREY, private secretary to the managing director, Birmingham Small Arms Company, Limited (Small Heath group); HERBERT DOUGLAS BARLOW, lately senior officer, Grade III, Council of Industrial Design; FRANK FREDERICK BATCHELDOR, works director, Small Electric Motors, Limited, Beckenham (Kent); ARTHUR BROOKE, lately departmental manager, Crofts (Engineers), Limited, Bradford; JOHN GEORGE HUNTER BROWN, lately manager, galvanizing department, Palmers Hebburn Company, Limited, Hebburn-on-Tyne; ALBERT BERTIE COOMER, secretary, Creed & Company, Limited, telegraph engineers, of Croydon.

PERCY ERNEST DAY, secretary, Bacon Curers' (War-Time) Association, Limited, and a director of Mineral Products, Limited, and a member of the London Committee of Rhodesian Cables, Limited; ALBERT FLINT, lately office manager, Brown Bayley's Steel Works, Limited, Sheffield; JOHN HENRY FREEMAN, lately manager, Coryton oil installation, Vacuum Oil Company, Limited; THOMAS JAMES GALE, designer, Pulsometer Engineering Company, Limited, Reading; ERNEST GARTHWAITE, chief engineer, Marconi Instruments, Limited, St. Albans; ELEAZER HALDER, dock superintendent, Middlesbrough Dock, Docks and Inland Waterways Executive; WILLIAM STANLEY HALL, chief of laboratory, Cooke, Troughton & Simms, Limited, of York; HAROLD WILLIAM HOGBEN, head of armament section, John I. Thornycroft & Company, Limited, Southampton.

DAVID MCALPIN HUNTER, assistant shipyard manager, Harland & Wolff, Limited, Belfast; FREDERICK WILLIAM JONES, engineer-in-charge of machine shop, Mullard Radio Valve Company, Limited, Mitcham (Surrey); SYDNEY KAY, a director and chief engineer of Cooper Roller Bearings Company, Limited, King's Lynn (Norfolk); ALEXANDER LAURIE, assistant chief draughtsman, Brown Bros. & Company, Limited, hydraulic and general engineers' founders, of Edinburgh; DUNCAN MACFARLANE, manager of the jig and tool design section of the Mirrlees Watson Company, Limited, Glasgow; JOHN CLARK METCALFE, senior ship draughtsman, Cook, Welton & Gemmell, Limited, Beverley (Yorks); CECIL ERNEST NASH, chief draughtsman, Radar Research and Development Establishment, Ministry of Supply, Malvern; MISS ETHEL WINIFRED NOAKES, higher executive officer, Ministry of Fuel and Power.

THOMAS CHARLES PARKER, production manager, Vickers-Armstrongs, Limited, Weybridge; EDWARD SIMPER, general works manager, Linotype & Machinery, Limited, Altrincham (Ches); JAMES STOCKWELL, works director, Switchgear & Cowans, Limited, Manchester; THOMAS BALYAIRD THOMSON, sales manager, Associated Clay Industries, Limited, Paisley; FREEMAN PAUL TOFTON, engineer manager and director, J. S. Doig (Grimsby), Limited, engineers, etc.; AUBREY ROCKETT WAKEHAM, technical officer, Petroleum Division, Ministry of Fuel and Power; THOMAS SHIELDS WATSON, assistant engineer manager, Harland & Wolff, Limited, Belfast.

British Empire Medals

Among the awards of the British Empire Medal were the following:—

B. C. ARCHER, head foreman, Blackstone & Company, Limited, Stamford (Lincs.); H. E. ASHTHORPE, centre lathe turner, K. & L. Steelfounders & Engineers, Limited, Letchworth (Herts); J. C. ATKINSON, honorary chief collector, National Savings group, National Gas & Oil Engine Company, Limited, Ashton-under-Lyne; F. B. BARD, mechanic-leading man, research laboratories, General Electric Company, Limited, Wembley; H. A. COPSEY, assistant foreman, Royal Gun and Carriage Factories, Ministry of Supply, Woolwich (Sidcup); J. W. COULTHARD, stores Class Grade III, Ministry of Supply Storage Depot, Eastriggs; M. W. COY, mechanic, National Physical Laboratory, Department of Scientific and Industrial Research (Weybridge).

H. FOSTER, chief die designer, Daniel Doncaster & Sons, Limited, Sheffield; A. E. HARDWICK, plant

(*Continued on page* 30, *advert. section*)

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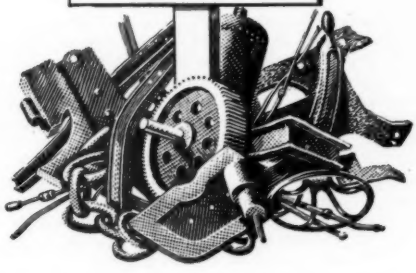
WHAT EVERY MANAGEMENT SHOULD KNOW ABOUT

scrap



What is scrap? Obsolete plant and machines, old spares, redundant buildings — anything made from iron and steel for which you have no foreseeable use.

What good is it to me? No good at all in its present state. But send it back to the steelworks and it can go to make the new steel that you and all steel-users need. Remember — a ton of scrap may make a ton of new steel.

Can't they make steel without scrap? Yes—but not enough steel. Last year, 58% of our steel was made from scrap. The more scrap we use the more coal, coke and iron ore we save for other important purposes.

What should I do with my scrap? See your local scrap merchant. He will be glad to help with dismantling and collection. If you have any trouble disposing of iron and steel scrap, write to the British Iron & Steel Federation for the address of your Joint District Scrap Committee.

What shall I get for it? You will be paid a fair price for your scrap. MORE IMPORTANT — you will be doing yourself and all steel-using firms a great service by helping to increase steel production.

SPEED THE SCRAP

SPEED THE STEEL

Issued for the STEEL SCRAP DRIVE by the British Iron and Steel Federation, Steel House, Tothill Street, London, S.W.1

T.28

Personal

SIR ALEXANDER McCOLL, well-known industrialist, is to be elected a Freeman of the Burgh of Kilmarnock, his native town.

MR. N. MCPHERSON has been appointed a director of Aluminium Corporation Limited. He will continue as general manager of the Company.

UPON his retirement as Under-Secretary to the Ministry of Materials on June 30, SIR DANIEL FENNELLY will be succeeded by MR. H. O. HOOPER.

AFTER 17 years as traffic manager of the Workington Iron & Steel Company branch of United Steel Companies, Limited, MR. THOMAS WILLIAMS has retired. He joined the firm in 1905.

ELECTED PRESIDENT of the Stoke-on-Trent Association of Engineers at the 38th annual meeting last week was MR. F. J. GOODSON, principal scientific officer of the British Ceramic Research Association.

THE NOTTINGHAM BRANCH of the Institution of Production Engineers has elected MR. E. BARRS as president. He is general manager and a director of the Myford Engineering Company, Limited, Beeston.

CHAIRMAN and joint managing director of W. C. Holmes & Company, Limited, engineers and by-product recovery plant manufacturers, of Huddersfield, MR. DAVID M. HENSHAW has been elected an honorary member of the Institution of Gas Engineers.

MR. LOUIS RIPLEY, O.B.E., who has been a member of the Board of Blackett, Hutton & Company, Limited, Guisborough, for the past five years, is resigning from the Board at the end of this month. Before becoming a director of Blackett, Hutton & Company, Limited, he was principal surveyor for steel for Lloyd's Register of Shipping.

MR. STEPHEN MCGLOUGHLIN, joint managing director of J. & C. McGloughlin, Limited, metal workers and engineers, etc., and of Tonge & Taggart, Limited, ironfounders, of Dublin, has been elected chairman, and MR. J. C. TONGE, managing director of Tonge & Taggart, Limited, has been elected a member of the council of the Institute for Industrial Research and Standards in the Republic of Ireland.

IN THE Birthday Honours List published recently a Knighthood was conferred on MR. H. W. BARBER, in recognition of his political and public services in Southport (Lancs). Mr. Barber has for many years been manager of the north-west England branch at Manchester of Johnson & Phillips, Limited, electrical engineers and cable manufacturers, of London, S.E.7. He has been leader of the Southport Town Council for several years, and has been Mayor of the borough twice.

MR. NORMAN G. ALLEN, engineering director of W. H. Allen, Sons & Company, Limited, engineers, of Bedford, left for the U.S. on June 5. He will visit a number of naval establishments and will go on to Canada to talk with the company's representatives, William Kennedy & Sons, Limited, at Owen Sound, and also with the Canadian Westinghouse Company at Hamilton. His company is building plant in connection with the Canadian naval rearmament programme.

THE Minister of Fuel and Power has appointed SIR HENRY TIZARD to be a part-time member of the North Thames Gas Board. Sir Henry was Permanent Secretary to the Department of Scientific and Industrial Research. He retired from the chairmanship of the Advisory Council on Scientific Policy at the end of March. He was for some time chairman of the Defence Research Policy Committee. Besides playing a leading part in radar research, he was the scientist behind wartime aeronautical research which produced some famous wartime aircraft, and was chairman of the Aeronautical Research Committee from 1933 to 1943.

I.B.F. Technical Council Report

(*Continued from page* 665)

T.S.42—Atlas of Typical Cast-iron Microstructures (*chairman—Dr. Brynmor Jones*): Although this sub-committee, the work of which is confined to the cast iron section of the atlas of microstructures, was not formed until December, 1951, it has already held two meetings and is making every effort to ensure that the completion of the work of preparing and assembling the photomicrostructures for this section of the atlas coincides with that of the work of the other two committees. Its terms of reference are:—"To prepare, with a view to ultimate incorporation in a complete atlas of microstructures of cast metals, typical microstructures of cast iron."

T.S.43—Cupola Development (*chairman—Mr. E. S. Renshaw*, A.I.M.): Arising from the report of sub-committee T.S.36, the Technical Council in December, 1951, appointed this sub-committee with the following terms of reference:—"To investigate hot-blast systems, carburization, desulphurization, water-cooling and combinations of these." The preliminary activities of the sub-committee, for which a long programme of work is envisaged, have been mainly concerned with a review of existing knowledge of the subjects which it is called upon to investigate.

T.S.44—Receivers (*chairman—Mr. C. S. Johnson*, B.SC.): The appointment of this sub-committee, which was formed in December, 1951, has also arisen from the report of sub-committee T.S.36. Its terms of reference are:—"To review the value and effect of receivers, including tapping systems and slag-handling and disposal methods." This sub-committee held its first meeting during the period under review.

Election of Chairman and Vice-Chairman, 1952-53

At the March meeting of the Technical Council, Mr. A. E. Peace and Dr. A. B. Everest were unanimously nominated for re-election as chairman and vice-chairman respectively for the year 1952/53. These nominations were unanimously approved and adopted at the meeting of the Council of the Institute held later in the same month.

The Report is signed by MR. A. E. PEACE, the chairman.

THE SIXTH ANNUAL REPORT of the general council of the Lancashire and Merseyside Industrial Development Association presented at the annual general meeting in Manchester on June 13, draws attention to the redundancy in the steel industry in the area, and states that although this had not caused serious unemployment, it has served to emphasize the economic vulnerability of the district. Efforts are being made, the report states, to ascertain whether further iron ore can be mined.